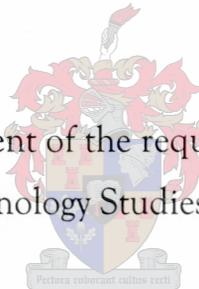


Knowledge Production and Research Development in Science and Technology at higher education institutions in the Eastern Cape Province.

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Thesis presented in partial fulfillment of the requirements for the degree of Master of Philosophy in Science and Technology Studies at the University of Stellenbosch



Supervisor: Professor J Mouton

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“Declaration

I the undersigned hereby declare that the work contained in this thesis is my own original work and has not previously in its entirety or in part been submitted at any university for a degree.

Signature

Date

Abstract

The aims of this study were to establish whether there had been discernable changes in the nature of knowledge production at higher education institutions in the Eastern Cape since the transition to democracy, and to relate these to international and national trends in the way knowledge is produced. In view of the emphasis in government policy on the development of science and technology, the study was focused on researchers in this area and on the administration of research in this context. The research was conducted through structured interviews with administrators and active researchers at the three technikons and five universities in the province.

The study found that there had indeed been changes, both in the way research is managed, and in the nature of the research itself. Research has become more applied over the last five years and there has been a move towards multidisciplinary, multi-institutional research, although administrators tended to underestimate the extent of this change. Research management has also become businesslike with the establishment of dedicated Deans/Directors of research on most campuses. Administrators ascribe these changes to new government policies and to changes in the requirements of funding agencies. Researchers, however, generally ascribe the changes to factors more directly related to themselves, such as changes in institutional research policy, more opportunities for multidisciplinary work and to greater linkage with the private sector. The study also found that many of the changes were already underway some time ago and that there was a degree of proactiveness in the way some institutions had realigned their research.

The study found that there are significant differences between formerly advantaged institutions and their historically disadvantaged counterparts. The latter are dominated by less well qualified staff and produce fewer research outputs than the former. Research cultures are less well developed and researchers complain of a lack of institutional support for research. Despite this, research continues to be a significant activity on these campuses. In general, staff at technikons are more positive about the future of research than their colleagues at universities, irrespective of historical advantage.

The study found that knowledge production has assumed some of the characteristics of so-called Mode 2 knowledge production as a result of a variety of national and international influences, and historically advantaged institutions have been able to initiate adjustments to the way in which research is done in anticipation of new policies. Publication of government policy on science and technology and on higher education may have accelerated the change but did not initiate it. The historically disadvantaged institutions, however, appeared to have done little in anticipation of new policy and have been forced to be reactive to recent government initiatives.

Abstrak

Die doel van die studie was om ondersoek na die voorkoms van waarneembare veranderinge in die karakter van die lewering van kennis by hoër-onderlig institute in die Oos-Kaap, na die oorgang van demokrasie, in te stel. Verder is gepoog om hierdie veranderinge in verband met internasionale en nasionale tendense, met betrekking to die wyse waarop kennis voortgebring word, te bring. In die lig van die regering se beleid aangaande die ontwikkeling van wetenskap en tegnologie was die studie op navorsers in hierdie rigting, sowel as die aanpassing van navorsing in hierdie konteks, gefokus. Die ondersoek was deur middel van gestruktureerde onderhoude met administrateurs en aktiewe navorsers aan die drie tegniese en vyf universiteite in hierdie provinsie uitgevoer.

Die ondersoek het aangedui dat veranderinge in die wyse waarop navorsing bestuur word en in die karakter van navorsing op sigself, inderdaad plaasgevind het. Navorsing het gedurende die afgelope vyf jaar toenemend toepaslik geword en hoewel administrateurs geneig het om die omvang daarvan te onderskat, was daar 'n merkbare verplasing na multi-dissiplinêre en multi-institutionale navorsing. Die administrasie van navorsing het ook, na die aanstelling van teogewyde Dekane/Direkteurs van navorsing by die meerderheid kampusse, toenemend bedryfsgerig word. Administrateurs skryf hierdie verplasing toe aan die nuwe staatsbeleid sowel as die veranderinge in die voorskrifte van befondsingsliggame. Op hul beurt skryf navorsers die veranderinge egter aan faktore wat meer op hulself van toepassing is, toe. Hierdie faktore sluit veranderinge in die institutionele beleid, die toename in geleentheid met betrekking tot multi-dissiplinêre werk, sowel as die toename in skakeling met die private

sektor, in. Dit is gevind dat verskeie van hierdie veranderinge al 'n geruime tyd onderweg is en dat daar 'n mate van pro-aktiwiteit met betrekking tot die wyse waarop sommige institute hul navorsing herspoor het, bestaan.

Die studie het bevind dat betekenisvolle verskille tussen voormalige bevoorregte institute en hul histories onbevoorregte ekwivalente voorgekom het. Uit die resultate het dit duidelik geword dat die personeel van die laasgenoemde institute oor die algemeen minder gekwalifiseerd is en dat 'n laer navorsingsopbrengs geproduseer word. Die navorsingskultuur is minder ontwikkel en navorsers is ontevrede oor die gebrek aan institutionele ondersteuning wat navorsing aanbetref. Ten spyte hiervan is navorsing voortdeurend 'n betekenisvolle aktiwiteit op hierdie kampusse. Personeel verbonde aan tegnicons is oor die algemeen meer positief oor die toekoms van navorsing in teenstelling met hul kollegas verbonde aan universitiete, ongeag die historiese agtergrond.

Die studie het ook bevind dat, weens die verskeidenheid nasionale en internasionale invloede en die oorspronklike aanpassings wat historiese bevoorregte institute tot stand laat kom het met betrekking tot die wyse waarop navorsing, met die oog op nuwe beleid, uitgevoer word, die produksie van kennis van die eienskappe van "Mode 2" aangeneem word. Die bekendmaking van die staatsbeleid aangaande wetenskap en tegnologie en hoër-onderrig kon uit eie beweging hierdie veranderinge bespoedig het, maar het dit nie geïnisieer nie. Histories onbevoorregte institute het tot dusver min werk gemaak van die vooruitsigte van die nuwe beleid en word genoodsaak om op onlangse regerings inisiatiewe te reageer.

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List of Acronyms and Abbreviations

ANC	African National Congress.
BT	Border Technikon.
CHE	Council on Higher Education.
CIS	Centre for Interdisciplinary Studies.
CSD	Centre for Science Development.
DACST	Department of Arts, Culture, Science and Technology.
DoE	Department of Education.
DOR	Dean/Director of Research.
DRC	Departmental Research Committee.
DTI	Department of Trade and Industry.
DVC	Deputy Vice Chancellor.
ECT	Eastern Cape Technikon.
EU	European Union.
FRC	Faculty Research Committee.
FRD	Foundation for Research Development.
FTE	Full-time Equivalent [student].
HAI	Historically Advantaged Institution.
HBU	Historically Black University.
HDI	Historically Disadvantaged Institution.
HDU	Historically Disadvantaged University.
HEI	Higher Education Institution.

HES	Higher Education Sector.
HWT	Historically White Technikon.
HWU	Historically White University.
IDRC	International Development Research Center.
IRC	Institutional Research Committee.
NGO	Non-government Organization.
NIS	National Innovation System.
NRF	National Research Foundation.
PET	Port Elizabeth Technikon.
RU	Rhodes University.
SANPAD	South Africa-Netherlands Research Programme on Alternatives in Development.
SAPSE	South African Post-secondary Education [system]
SIDA	Swedish International Development Cooperation Agency.
THRIP	Technology and Human Resources for Industry Programme.
UFH	University of Fort Hare.
UNITRA	University of Transkei.
UPE	University of Port Elizabeth.
USAID	United States Agency for International Development.
UTR	University of Transkei.
UWC	University of the Western Cape.
VC	Vice Chancellor.
VU	Vista University.

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Chapter 1

Introduction and Background

1.1 Global and national issues in knowledge production.

Much has been written over the last 40 years or so about the increasingly central role that knowledge, and the information upon which it is based, now plays in modern society. Prior to the Industrial Revolution knowledge was focused and was passed down from generation to generation in a linear way. The general “broadcasting” of knowledge was rare and confined to that stratum of society that was affluent and had the time and inclination to indulge in scholarly pursuits. The Industrial Revolution changed all that, although the change took some time to manifest itself. The advent of factories for the mass production of goods gave rise to a clearly defined factory worker class, the “urban factory proletariat”, and fundamentally altered the structure of labour (Kranzberg 1985).

The pre-existing stratum of a worker class became itself stratified as industry required the services of those who had knowledge of the collective technical functioning of factories and complex machinery. This new sub-class of worker, although required in smaller numbers than factory-floor workers, defined what could perhaps be called the vanguard of knowledge workers, who possessed “meta-knowledge” about the means of production that their predecessors did not have,

nor were required to have. This situation persisted until the mid twentieth century, augmented by the technological demands of two world wars and the increasing “scientification of technology” (Böhme *et al*, 1978).

By the 1960’s social scientists began to conceive of society in a new way which attempted to recognize the increasingly pivotal role of knowledge. Commentators such as Daniel Bell (1964) - “post-industrial society”, Robert E. Lane (1966) - “knowledgeable society” and Peter Drucker (1969) - “knowledge society”, were influential in pointing out that, to an ever increasing extent, manual labour was being replaced by “intellectual labour”.

Why has knowledge become so central to modern society? Certainly the demands of industry, and the technologies which drive it, for skilled and educated workers has raised the general level of education and broadened the world view of much of the population of developed nations. Social capital, in the sense used by Pierre Bourdieu (1986), is to be gained through education; knowledgeable people have status in society. This development, of improved education for larger numbers of people, may, in itself, have been sufficient to place knowledge closer to centre stage in modern society. However, another development, or perhaps a suite of related developments, consolidated its position to the extent that recent commentators, such as Stehr (1994), feel confident in proclaiming that we now live in a “knowledge society”. This development was modern computer and

telecommunications technology, which not only allows the processing and storage of vast amounts of information, but also its rapid dissemination. To be knowledgeable today means having the ability to access information on a global scale and to use this to achieve some form of social action (Stehr, 1994).

Although the ability to access and use information is an important skill for the individual, it is vital for society as a whole that new knowledge is produced. The endless re-working of existing knowledge would ultimately lead to social stagnation and undermine our ability to deal with the stream of social and environmental problems that we face. There is currently a lively debate concerning the way in which knowledge is produced. At the heart of this debate is the role that higher education institutions play in knowledge production. Over the last 25 years or so several commentators have proposed that the way in which knowledge is produced has changed, and have coined various terms to describe this “new way”. We have “finalized science” (Böhme, 1976); “post-normal science” (Funtowicz and Ravetz, 1993); “Mode 2” (Gibbons *et al*, 1994) and “post-academic science” (Ziman, 1994). All of these are said to differ from the traditional form of knowledge production, so-called Mode 1, which occurs within academic disciplines and in which there is a clear distinction between fundamental and applied knowledge.

According to Gibbons *et al* (1994) Mode 2 knowledge production possesses the following characteristics:

- Universities have lost their monopoly on knowledge production, which now occurs in a wider range of institutions (“organizational diversity”).
- Knowledge production takes place in the context of application and not for the purpose of acquiring fundamental knowledge through basic research. This idea of application differs from the traditional notion of applied research, which involves problem-solving carried out within a disciplinary framework, and refers to problem-solving focused on a particular application.
- Research is characterized by transdisciplinarity in which experts from various fields collaborate to solve research problems. Each new problem is tackled by a different combination of experts as required.
- Quality control is no longer executed by peer review alone but involves other players from various sectors of society.
- Knowledge production becomes socially accountable and reflexive. Research is guided to an increasing extent by socio-political values.

A central issue in the debate around the Gibbons thesis is whether Mode 2 really is new. Some commentators have pointed out that much of what is

claimed to be characteristic of Mode 2 has been around for a long time. As Weingart (1997) points out, universities have only recently become important areas of knowledge production. He says:

Neither in Germany nor in France, and not even in the USA have they [universities] ever been the only ones. Government research in Germany dates back to the mid-19th century and has expanded ever since [in] parallel with the expansion of the state's welfare functions. In France the tradition of research in service to the state dates even further back to the times of the revolution.

Another important aspect of the debate is the degree to which knowledge production has become transdisciplinary, defined by Gibbons *et al* (1994) as “a continuous linking and relinking, in specific clusterings and configurations of knowledge which is brought together on a temporary basis in specific contexts of application.” Some would say that this too, is old hat (Weingart, 1997).

Finally, before dealing with policy issues, it is necessary to clarify the meaning of the term strategic research, which, in this study, is taken to mean medium to long-term research of a basic nature that leads to applications. Strategic research may be of a Mode 1 type, if conducted within the limits of particular disciplines, or Mode 2, if it is transdisciplinary in nature.

1.2 Policy issues in South Africa: Science and Technology, and Higher Education.

South Africa has experienced fundamental socio-political changes in recent years, with the change to a democratic government in 1994 representing a watershed in the country's recent history. This, and the fact that these changes have produced *inter alia* a veritable blizzard of policy reviews and initiatives involving practically every facet of South African life, including of course Science and Technology and Higher Education, are the reasons for the post-1994 focus of the study.

Although policy changes in these areas have been influenced by the debate around Mode 1 to Mode 2 knowledge production, it is not the purpose here to engage in this debate. What is, however, important in the present study, perhaps even its *raison d'être*, is the fact that the "Gibbons thesis" has had a profound influence on the formulation of current policies on Science and Technology¹ and Higher Education in South Africa (Kraak, 1995). These policies, driven initially by the demands of the Reconstruction and Development Programme (Kraak and Watters, 1995), are in turn re-shaping the higher education landscape in this

1

For a comprehensive review of Science Policy in South Africa see Marais (2000) "Perspectives on Science Policy in South Africa"

country. The White Paper on Science and Technology (DACST, 1996) paraphrases Gibbons on Page 6 thus:

“Traditional ways of producing knowledge within single disciplines and institutions are being supplemented by knowledge generated within various applied contexts.”

The White Paper goes on to say:

“A national system of innovation benefits from ‘knowledge practitioners’ being located in multiple knowledge generating sites and institutions such as higher education institutions, government and civil society research organisations, and private sector think tanks and laboratories.”

Such sentiments have been translated into sweeping changes to the structure of the South African Science and Technology system. The White Paper on Science and Technology sets out a vision for the development of science and technology in South Africa in which all South Africans will enjoy a better quality of life and participate in a competitive economy. To attain this vision three goals were articulated thus:

- “establishment of an efficient, coordinated and integrated system of technological and social innovation..”
- “development of a culture within which the advancement of knowledge is valued as an important component of national development”
- “improved support for all kinds of innovation...”

The fundamental vision of research is one of a tool that the State can use to promote economic development and enhance quality of life and thus the emphasis is on applied research. The policy proposes a coordinated system of technology development, which emphasizes the role of innovation. Indeed a central pillar of this policy, and one of the most important departures from previous practice, is the concept of a National Innovation System (NIS).

The White paper on Higher Education also contains echos of the Mode 2 idea (DoE, 1997). For instance it says (page 10) that:

“The associated “knowledge society” has particular implications for the higher education system. In the context of higher education, in particular, developments in information technology are breaking down national boundaries and those between institutions. Access to higher education is no longer necessarily determined by physical space and location.”

Under the section on Structure and Growth the White Paper says that the Ministry will “Encourage new learning and teaching strategies, in particular, modifying traditional models of discipline-based and sequential courses with a flexible credit-based system.” This is clearly intended to foster a multi-disciplinary multi-institutional mode of tertiary education.

Obviously considerations of modes of knowledge production are not the only driving factors behind these policy initiatives (Kraak, 1997). Equally

important is the recognition afforded to globalization and the need for national competitiveness. The new science and technology policy addresses these issues directly by introducing the concept of a national system of innovation mentioned above. The objective of this move is to:

... enhance the rate and quality of technology transfer and diffusion from the science, engineering and technology (SET) sector by the provision of quality human resources, effective hard technology transfer mechanisms and the creation of more effective users of technology....

In recognizing the need for international competitiveness, the White Paper on Higher Education Transformation (DoE, 1997) identifies the following areas, *inter alia*, that must be addressed:

- to overcome “ an historically determined pattern of fragmentation, inequality and inefficiency, increase access for black students and for women, generate new models of learning and teaching to accommodate a larger and more diverse student population”
- policy must “ restructure the higher education system and its institutions to meet the needs of an increasingly technologically-oriented economy. It must deliver the requisite research, the highly trained people and the useful knowledge to equip a developing society with the capacity to participate competitively in a rapidly changing global context”
- policy must “focus growth primarily in career-oriented courses at certificate

and diploma level and in science, engineering and technology programmes taking into account labour market signals.”

The emphasis is on vocational programmes currently offered chiefly by technikons. Provision for research funding for S&T embodied in the White Paper on Science and Technology (DACST, 1996) will affect higher education institutions in various ways. On the 1st April 1999 a new body, the National Research Foundation (NRF) came into being. This is (for the present at least) an amalgamation of the Foundation for Research Development (FRD) and the Centre for Science Development (CSD). These organisations were respectively responsible for funding research in the natural sciences and in the social sciences and humanities. An important point here is that while these two bodies previously disbursed funds to the higher education sector only, funding through the new NRF is accessible to a wider range of institutions including those in the private and public sectors. However, this is not merely an amalgamation of the functions of the FRD and CSD as Groenewald (1998) suggests. While FRD and CSD funds were targeted at the HE sector exclusively, the NRF Bill makes it possible for other players, such as NGO's, corporations and even quasi-government institutions, to apply for research funds and thereby compete with the HE sector.

Apart from these structural changes, the S&T policy also emphasizes new criteria in the assessment of research. Under the section dealing with principles

for funding research in the HES the White paper has this to say:

The primary criteria of support will continue to be the quality of the research proposed, the relevance of that research to the goals and objectives of South Africa's vision for the future, and the contribution the activity will make to redressing the human and institutional imbalances of the past.

The demand for relevance has implications for the nature of the research undertaken across the spectrum of research institutions, including those in the HES. Recent studies suggest that research in South Africa has shifted from basic towards applied, with much of it occupying the middle ground known as strategic research, where application is in the medium term (Mouton, 1998). Notwithstanding the view that the term "strategic" may be used by researchers as a device for attracting research funds (Rip, 1997), research in the university sector appears to have assumed some of the complexion of that traditionally associated with technikons. This has led in some cases to overlap and duplication of effort between these two sectors of the HES.

The last part of the above quote is of particular importance to the HES because it implies that research excellence is a necessary but insufficient criterion for research funding. Without a redress or capacity-building component, research proposals will have a small chance of being funded. The increased emphasis on capacity-building and redress of the FRD and CSD, and continued in the NRF,

has led *inter alia* to a premium being placed on female and black students.

The White Paper on Higher Education (DoE, 1997) introduces a new funding policy, to be effected in 2001, to drive the process of attaining equity and capacity-building in an efficient way. Firstly, in addition to a formula-based subsidy, there will also be earmarked funding which will be used for redress purposes and which will replace the current block grant for research. This will take three forms

i) institutional redress which will include development of managerial capacity, library facilities, curriculum development etc.

ii) individual redress eg student loans and

iii) other funding, such as development of research capacity, postgraduate training, capital projects etc.

The formula part of the funding will be based on funded student places. In a refinement of the present FTE system, places will be funded on a two-dimensional funding grid, with level and field of study constituting the dimensions. Institutions will be allocated student places in selected fields according to information provided in the three-year rolling plans recently submitted to the DoE.

Although the formula will provide for the full costs of training, the cost of research will not be included. Such costs will be covered within the earmarked

portion of the subsidy, but these will not come without strings attached. According to Groenewald (1998) "...the allocation of student places [at the masters and doctoral level] will be based on performance indicators such as research capacity, competitive success and research output of faculty staff".

Furthermore, research funding for post graduate students will be for research-based degrees only. Support for coursework-based degrees will have to come from the formula portion. Institutions will also have to account for their expenditure on research.

The policy thus embodies the concepts of concentration and selectivity as principles in the efficient allocation of scarce resources. As such it replaces the current system of giving something to everyone. The White Paper says:

"In view of the national strategic importance of research, and in order to ensure that the relatively scarce funds available for the development of research capability are well targeted, public funds for participation in research, whether basic or applied, should not be spread over all faculties or schools in all institutions but should rather be concentrated in those areas where there is demonstrable research capacity or potential."

1.3 Implications of post-apartheid Science and Technology, and Higher Education Policy.

The implications of the above policy changes will be felt at three levels and in two dimensions within the HES. From a national perspective it seems unlikely

that all departments within the existing 36 HEI's (21 universities and 15 technikons) will continue to do research. Apart from the problems of duplication, there are simply not the resources, human and financial, to support this. Concentration of research capacity, at least in the form of departmental amalgamations, seems inevitable. The latest proposals from the Council on Higher Education's Task Team on Size and Shape, for example, depict a system in which many of today's research performing HEI's will, in future, focus on undergraduate training as "bedrock" institutions with little or no focus on research (CHE, 2000). It is, however, still unclear when and how this Sword of Damocles will fall. This being the case, each individual institution (the next level of the system) must play the game with the expectation of survival.

With the demise of the blind research funding the bottom line for all universities will be significantly thinner next year. Ironically, the technikons may welcome this move as the existing system is considered by some to be discriminatory. To recoup this money universities must turn to alternative sources of funding while strengthening their post graduate programmes. The only viable alternative source of funding is from the private sector and already there is strong evidence of a shift towards greater industry linkage with the HES. University research managers would do well to promote those sectors of their institutions which are capable of forging such links. This implies that decisions need to be

taken as to which areas to support for post graduate development and which to let go. There is no doubt that the system will favour the strong. Those institutions with established links to industry and international donors will strengthen these links. The previously disadvantaged institutions will struggle to access funding in this way resulting in a polarization in which the HDI's will rely mainly on government and the other institutions on corporate funding. This raises questions such as:

Will we see a new binary system consisting of “market” and “non-market” universities (Orr, 1997)?

In such a scenario who will look after the less market-oriented fields of study, particularly in the humanities?

Who will be responsible for developing a research culture in those departments not presently active within an institution but with the potential to produce good research?

The answer to the last two questions lies largely with the universities who have a responsibility to society to nurture both society-oriented and cultural fields, such as philosophy and sociology, and to develop fledgling research areas and departments. This will have to be done from internal funds as current policies definitely lean away from such subjects, despite rhetoric to the contrary.

The third level, that of the research performing unit and individual

researcher, will feel the implications of our new policies from a number of sources. Within their own institutions they will have to align their work to fit in with the support philosophy of management, unless they are fortunate enough to have independent funding. Those who rely on internal research funding will be particularly at risk and will be under pressure to bring in external funds. It can thus be expected that there will be a drive towards greater industry linkage, multidisciplinary and multi-institutional research.

While the implications of the new policies will be felt at various levels in the HES, they will be felt to varying degrees depending on the nature of the institutions involved. The HES is not a homogeneous structure, comprising as it does universities and technikons. Notwithstanding the blurring that has occurred in recent years, they are still very different beasts with different structures and missions. On one hand technikons are ideally placed to respond to the demands of research in the context of application and industrial linkage. On the other hand they are somewhat out of their depth when it comes to providing the high-level training that their new degree-awarding status demands. Universities, on the other hand, still retain something of the ivory tower nature which has characterized them for so long. The immediate responses of these two sections of the HES to policy demands will obviously be different but their effects will be convergent, leading to increased blurring of the boundary between them.

The second dimension in which the implications of new policy will be felt is in the distinction between historically disadvantaged and historically advantaged institutions alluded to above. Again some blurring of the distinction has occurred recently with the changing demographic structure of the student body, particularly at formerly white institutions, but the legacy of separate development is hard to shrug off. The main problem with the HDI sector is the lack of human and physical resources which places them at a distinct disadvantage in an increasingly competitive arena. These are acute problems for South Africa's rural campuses where the social infrastructure, taken for granted in larger centres, is lacking. This makes it difficult to retain good post graduate students and attract quality staff, factors which are reflected in output indicators which show the rural universities trailing the pack (Subotzky, 1997).

Although the effects of the new science and technology policy will be felt directly within the HES, there will also be indirect effects as government funding agencies, such as the NRF, Medical Research Council and Agricultural Research Council, adjust to the new situation. The Water Research Commission, for instance, has just announced a Partnership Programme designed to increase involvement of HDI's in water research, while the NRF has reviewed its programmes and policies (NRF, 2000) and a new suit of initiatives has been announced. However, even before the formation of the NRF, funding agencies

were adjusting their funding criteria in accordance with new government policy (FRD, 1995; MRC, 1997; CSD, 1998). Multi-institutional projects which addressed capacity-building among black academics and students were favoured. Projects involving partnerships with industry were also actively encouraged. The Department of Trade and Industry (DTI)-FRD programme called Tertiary Human Resources for Industry (THRIP) is a good example. This resulted in project proposals involving institutions which previously had little contact with each other.

1.4 Research Questions

It is clear from the previous discussion that over the last few years, new demands have been made on our higher education institutions. The demands of globalization and the need for international competitiveness have been translated by policy-makers into a requirement for relevance and capacity building in research and training, predicated on the principles of concentration and selectivity. Within this context it is appropriate to ask: How has the HES responded to these challenges? Obviously a complete answer to this question, if there is one, would require a national project. The question may, however, be approached on a more modest scale by focusing on specific issues within the general area of knowledge production. Given the emphasis on science and technology research and training that is apparent in government policy documents, the focus of the present study

therefore is on knowledge production in science and technology at HEI's in the Eastern Cape Province of South Africa.

This geographic location was chosen partly for logistical reasons, as the researcher is based at the University of Transkei, in Umtata, and also because the province has a mix of HEI's that mirror the country as a whole (see Chapter 2) and it is reasonable to expect that the results of the study would have wider validity.

This study focuses on the following questions:

- What is the nature of knowledge production (research) in science and technology at higher education institutions in the Eastern Cape?
- Have institutional policies in respect of research and its administration changed over the last five years and if so to what can such changes be ascribed?
- Has the nature of research in these institutions changed over the last five years and if so to what can this be ascribed?

Nested within these, of course, are a number of sub-questions relating, for instance, to the awareness of administrators and researchers of policy developments locally and abroad; attitudes and perceptions of researchers to institutional and government support for research; sources of funding and

distribution of budgets within institutions; changes in research output etc.

Underlying these questions is the notion that, given the changes in policy regarding science and technology and higher education, and their implications, outlined earlier in this Chapter, it may be possible to discern changes in institutional policies towards research, and in the way in which research is administered. This study, it is hoped, will provide an analysis of research policy and administration in HEI's, which will contribute to a better understanding of the nature of research management and its practice in this country.

1.5 Research approach and methodology.

The approach taken in this study was one of recorded personal interviews with academics and research administrators, using semi-structured questionnaires. These questionnaires are appended in Appendix A. Research administrators at each of the eight institutions were approached and asked to suggest names of academics on their staff who were actively involved in research in science and technology-related areas. By "actively involved" was meant that the respondent had published in the international literature within the previous two years and was currently engaged in research, either towards a higher qualification or as a stand-alone activity. Once suitable respondents were identified, arrangements were made for site visits to conduct personal interviews. The only exception to this was with

the research administration at Vista University, which is based in Pretoria. In this case the administrator's questionnaire was emailed to them and their responses were returned in the same way. After trialling the questionnaire with colleagues at Unitra (not the same ones interviewed in the main study), it was emailed to all respondents two weeks prior to the interviews to give them an opportunity to consider the questions and collect information. The fields of study covered in the survey were Botany, Biochemistry, Ceramics, Chemistry, Computer Science, Geography, Mathematics, Mechanical Engineering, Pasture Science, Physics, Statistics and Zoology, with an average of three respondents within each field.

It immediately became apparent that there were large differences in the populations of potential respondents at each institution. Essentially at universities there was generally a larger pool of researchers to choose from than in technikons. However, within these sectors the historically advantaged institutions had far larger pools of researchers than historically disadvantaged institutions. It was therefore necessary to limit the number of respondents from each institution in order to maintain a balanced design and to reduce the possibility of dominance by particular institutions. Ultimately five respondents, representing active researchers, were chosen from each institution, giving a total of 40, in addition to the eight administrators. At some institutions this number represented virtually the entire set of active science and technology researchers. It was also the intention

to interview people who had been involved in research for some years and at most universities this was possible. At the younger institutions and some technikons, however, this was simply impossible as no such people existed. With two exceptions all respondents were between the age of 30 and 55. The exceptions were two senior professors emeritus who had been with their respective institutions for many years.

Twenty-two of the respondents were white and male (Fig. 1.1a), ten were white and female, four were black males and four were black females. All of the black respondents were from historically black institutions. These figures reflect national gender and racial imbalances in science (FRD, 1996). There were twenty white male professors, and five white female professors. There were three male senior lecturers (MSL) and five female senior lecturers (FSL). The remainder comprised three male lecturers (ML) and four female lecturers (FL). None of the black respondents held positions above senior lecturer (Fig. 1.1b). Among the administrators all were white and only one was female.

Although separate questionnaires were employed for administrators and researchers, the first four questions were common to both groups. This was to establish the degree of congruence between them regarding their view of their institution's policy on research, their knowledge of policy initiatives, particularly those embodied in the White Papers on Higher Education Transformation and

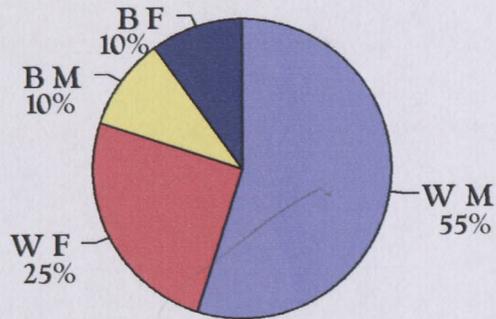


Figure 1.1a. Demographic composition of respondents in the Researcher group.

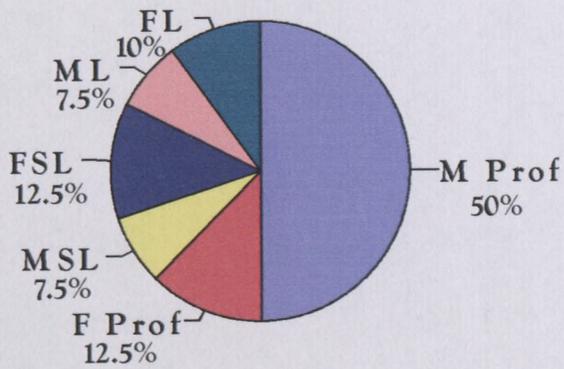


Figure 1.1b Positions held by gender in the Researcher group.

on Science and Technology, and their opinions on whether their research policy had changed over the last five years and what may have driven these changes. After Question four, the questionnaires diverged in order to obtain information about research in the institution as a whole (administrators) and details of individual research (researchers). The analyses of the administrators' responses are presented in Chapter 3 while those of the researchers are presented in Chapter 4. Additional information, such as publication and postgraduate student outputs, was obtained directly from research administrators, while historical information and information on institutional and staff structure was obtained from 1999 prospectuses.

As with all sampling procedures there are potential problems to be kept in mind. Firstly the sample size is smaller than what would be considered ideal. Obviously one can do nothing about the fact that each institution has only one research administrator, but one could perhaps argue for a larger number of respondents in the researcher group. The reasons for the present protocol have been given above. It was felt better to have a similar number of respondents across all institutions so that they have equal weighting. This meant using a common denominator derived from what was available at the smaller institutions. Nevertheless the sample size compares well with a similar study by Kraak and Watters (1995) in the Western Cape.

A second problem relates to the racial and gender mix of respondents. Since it was left mainly to the administrators to suggest names of respondents based on the criteria outlined above, it is possible that this predominantly white male group was sub-consciously biased in favour of white males in their choice of “active researchers”. Although this cannot be discounted, reference to the staff lists for the various institutions contained in their prospectuses, reveals that much the same breakdown of race and gender exists in science and technology generally as emerged in the respondents group. The fact is that, even at historically black institutions, there are very few active black and female researchers in science and technology. This accords with national figures (FRD, 1996).

Notwithstanding the above, the small sample size does place limits on the types of analyses that are appropriate. Although a quantitative approach, supported by graphical analyses, will be adopted, statistical procedures will be largely non-parametric and will concentrate on response frequencies, proportions and temporal trends.



Chapter 2

Profiles of Eastern Cape Higher Education Institutions

2.1 Introduction.

The nature of knowledge production and its management in an institution is as much a function of its history and character as it is of external factors. This chapter briefly examines the history and structure of the higher education institutions in the eastern Cape as a background to a formal analysis of their research and its management.

Eight higher education institutions have campuses in the Eastern Cape Province. Three of these are technikons, the oldest being the Port Elizabeth Technikon, with a branch at George, followed by the Border Technikon, based at Potsdam between East London and King Williams Town, with branches in East London and in Bisho, and the youngest, the Eastern Cape Technikon (formerly the Transkei Technikon), based in Butterworth with branches in East London, Queenstown and Umtata. The other five campuses are those of Rhodes University in Grahamstown (the oldest), with a branch in East London, the University of Fort Hare in Alice, the University of Port Elizabeth, the University of Transkei in Umtata, with a branch in Butterworth and the Port Elizabeth campus of Vista University.

Apart from the division of these institutions into technikons and universities,

they may also be categorized according to their respective histories as predominantly English or Afrikaans and also as historically disadvantaged or advantaged within the apartheid system. Under these classifications UPE and PE Technikon would be predominantly Afrikaans (at least initially), while the rest would be predominantly English (although in the case of the former black institutions this would be as a second language). Under the second classification UPE , PE Technikon and Rhodes University would be considered historically advantaged while the rest would be considered disadvantaged. While it may be debatable whether these classifications have meaning today, it would be surprising indeed if the diverse histories of these institutions had no influence on their current policies and on their ability to respond to contemporary challenges.

2.2: Technikons: History, structure and staff profiles.

Port Elizabeth Technikon (PET).

This institution came to be known as the Port Elizabeth Technikon in 1979 although it is in fact much older, having been established as a School of Art in 1882. By 1925, after the introduction of several technical courses, it became known as the Technical College of Port Elizabeth. In 1968, it was renamed the College for Advanced Technical Education, before assuming its current name. There are currently ten faculties viz. Applied Science; Art and Design; Civil Engineering,

Building, Architecture and Agriculture; Commerce and Government Studies; Communication Studies; Computer Studies; Education; Electrical Engineering; Management and Mechanical Engineering. The headcount of students in 2000 was 9785, of which more than half came from black communities (Port Elizabeth Technikon, 1999).

Staff profile.

Table 2.1 gives the breakdown of total academic staff (270) by qualification based on the 1999 Prospectus. Staff holding technical qualifications, such as National Diplomas, and those holding Masters degrees account for 30% and 29.2% of the total respectively. Those holding Bachelors degrees account for 19.6% while those with Honours degrees¹ and Doctorates account for 14% and 7.2% respectively. The relative proportions of academic staff involved directly with science and technology and others are 60% and 40% respectively.

Within the category of science and technology staff, approximately equal proportions have technical qualifications and Masters degrees (34.5% and 33.3% resp.), while those with Bachelors degrees, Honours degrees and Doctorates make up 16.7, 9.3 and 6.2% respectively. Within the remainder of the academic staff there is an even distribution of technical qualifications (23%), Bachelors degrees (24%), Honours degrees (21%) and Masters degrees (23%). Only 9% of this group hold

¹ Honours degrees in this study include postgraduate diplomas.

Table 2.1 Breakdown of academic staff by highest qualification at Technikons and Universities in the Eastern Cape. Data are **percentages** of total academic staff.

Category	PET	BT	ECT	RU	UFH	UPE	UTR	VU(PE)
Total staff	270	111	113	320	340	255	393	96
Diploma	30	28	57.5	0	0.3	0.5	0	0
Bachelor	19.6	40	12	7	11	6	4.5	5
Honours	14	20	15	9	24.7	12	25	26
Masters	29.2	10	13	28	39	33	49.5	41
Doctorate	7.2	2	2.5	55	25	48.5	21	23
S&T staff	60	36	70	40	34	44	27	25
Diploma	34.5	40	63	0	0.5	0	0	20
Bachelor	33.3	37.5	12	5.5	14.5	1	7.5	0
Honours	9.3	12.5	10	6	26	7	24.5	12
Masters	16.7	10	11	20	28	34	40	44
Doctorate	6.2	0	4	68.5	31	58	28	24
Non-S&T staff	40	64	30	60	66	56	73	75
Diploma	23	21.5	44	0	0	1	0	0
Bachelor	24	41	12	8	9.5	10.5	4	7
Honours	21	23	26	12	24	15	25	30
Masters	23	10.5	18	34	45	33	53	41
Doctorate	9	4	0	46	21.5	40.5	18	22

Doctorates.

Border Technikon (BT).

This institution was created in 1984 as the Ciskei Technikon, within the then independent homeland of Ciskei, although academic programmes commenced only in 1988. Initially situated in Zwelitsha, the technikon moved to a new campus in Potsdam which was officially opened in 1997. The technikon houses two faculties namely Applied Technology and Human Science (Border Technikon, 1999). In 2000 there were 4711 students enrolled.

Staff profile.

Table 2.1 gives the breakdown of total academic staff (111) by qualification based on the 1999 Prospectus. Staff holding Bachelors degrees account for the largest proportion (40%) followed by those with technical qualifications (28%). Those holding Honours and Masters degrees account for 20% and 10% respectively, while only 2% hold Doctorates. The relative proportions of academic staff involved directly in science and technology and others are 36% and 64% respectively.

Among science and technology staff 40% have technical qualifications and 37.5% have Bachelors degrees. The remainder comprises those with Honours (12.5%) and Masters degrees (10%). There were no staff in this category with a Doctorate. Within the remainder of the academic staff 41% hold Bachelors degrees while those with technical qualifications and Honours degrees are in equal

proportion (21.5% and 23% respectively). The remainder consists of those with Masters degrees (10.5%) and Doctorates (4%).

Eastern Cape Technikon (ECT).

This institution was established in 1985 as a branch of the University of Transkei (Unitra). In 1989, after the inauguration of several technical courses including the National Diploma in Electrical Engineering, the name was changed to the Unitra Technikon and a semi-autonomous council was established. In 1991 the name was changed to the Transkei Technikon and the institution moved to its present campus on the outskirts of Butterworth. Complete autonomy was granted by the then Transkei Government in 1994. The technikon has three faculties, Engineering, Applied Technology and Business Sciences (Eastern Cape Technikon, 1999). There are currently 3200 students enrolled.

Staff profile.

At this institution 57.5% of the total academic staff (113) hold technical qualifications (Table 2.1). There are equal proportions of Bachelors degrees (12%), Honours degrees (15%) and Masters degrees (13%). Only 2.5% of the staff have Doctorates. A large proportion of the staff (70%) are involved in science and technology. Of this group 63% hold technical qualifications, while Bachelors, Honours and Masters degrees account for 12%, 10% and 11% of the total

respectively. Only 4% hold Doctorates. Of the remainder 44% hold technical qualifications, 12% Bachelors degrees, 26% Honours degrees and 18% have Masters degrees. There are no Doctorates among this group.

2.3: Universities: History, structure and staff profiles.

Rhodes University (RU).

Rhodes University College was founded by an Act of Parliament in 1904 and became a constituent college of the University of South Africa in 1918. However, it was not until after the Second World War that the Rhodes University Private Bill was passed in 1949 and the university officially inaugurated in 1951. In 1961 a branch was established in Port Elizabeth but Rhodes withdrew in 1964 when the University of Port Elizabeth was established. In 1981 Rhodes opened a branch in East London (Rhodes University, 1999). Rhodes University has six faculties; Humanities, Science, Law, Education, Commerce and Pharmacy. There are currently 5634 students enrolled.

Staff profile.

The majority of the 320 academic staff at Rhodes (55%) hold Doctorates (Table 2.1). Those with Bachelors degrees account for only 7%, those with Honours degrees for 9% and the remainder with Masters for 28%. No academic staff hold

only technical qualifications. Staff involved with science and technology account for 40% of the total. Of these 68.5% hold Doctorates, 20% Masters, 6% Honours and 5.5% have Bachelors degrees. Among academic staff not directly involved with science and technology 46% have Doctorates, 34% have Masters, 12% have Honours degrees and the remainder (8%) hold Bachelors degrees.

University of Fort Hare (UFH).

The autonomous University of Fort Hare came into being in 1970 when Ciskei became a self-governing territory, but the institution itself is much older. As the Lovedale College the first students registered in 1916. In 1946 the College was affiliated to Rhodes University and renamed the University College of Fort Hare. In 1959 the “Bantu education” policy of the Nationalist Government was extended to tertiary level and the College was placed under the stewardship of the University of South Africa (University of Fort Hare , 1999). With the reincorporation of the Ciskei into South Africa in 1994 Fort Hare took its place as one of the 21 independent universities in this country.

The university has seven faculties; Arts, Agriculture, Education, Economic Sciences, Law, Science and Theology. In 2000 there were 3850 students.

Staff profile.

Of the total academic staff (340) at Fort Hare 25% hold Doctorates, 39%

Masters degrees, 24.7% Honours and 11% Bachelors degrees (Table 2.1). Only 0.3% hold technical qualifications. Thirty-four percent of the staff are involved in science and technology. Of these 31% hold Doctorates, 28% Masters degrees, 26% Honours and 14.5% Bachelors degrees. Those holding technical qualifications only comprise 0.5%. Of the non-science and technology staff 21.5% hold Doctorates, 45% Masters degrees, 24% Honours and 9.5% Bachelors degrees.

University of Port Elizabeth (UPE).

This institution came into being by Act of Parliament in 1964. After occupying temporary buildings in the city, which included those used by the short-lived Port Elizabeth branch of Rhodes, the University moved to the Summerstrand Campus in 1974 (University of Port Elizabeth, 1999). It was not until 1979, however, that the move was completed after new science blocks were built.

There are six faculties at UPE; Arts, Science, Education, Economic Sciences, Law and Health Sciences. There were 6900 students enrolled in 2000.

Staff profile.

Slightly less than half (48.5%) of the academic staff of 255 have Doctorates. A further 33% have Masters degrees, 12% Honours, 6% Bachelors degrees and 0.5% have technical qualifications (Table 2.1). Science and technology staff account for 44% of the total. Of these 58% have Doctorates, 34% Masters degrees, 7% Honours and 1% Bachelors degrees. No staff in this category have only technical

qualifications. Among non-science and technology staff 40.5% have Doctorates, 33% Masters degrees, 15% have Honours degrees and 10.5% Bachelors degrees. Those who have technical qualifications only account for 1%.

University of Transkei (UTR).

The University of Transkei was established by Act of the Transkei Government in 1976 and the institution was officially opened in May 1977. It was initially a branch of Fort Hare and occupied temporary buildings in Umtata. In 1979 the institution became autonomous and the move to the present campus to the west of Umtata took place in 1980 (University of Transkei , 1999). The university has six faculties; Arts, Economic Sciences, Education, Health Sciences, Law and Science. In 2000 there were 3700 students enrolled.

Staff profile.

Academic staff who have Doctorates account for 21% of the total of 393, those with Masters degrees comprise 49.5%, Honours degrees comprise 25% and Bachelors degrees account for 4.5% (Table 2.1). Just over a quarter of the staff (27%) are involved in science and technology. Among this group those with Doctorates account for 28%, Masters for 40%, Honours degrees for 24.5% and Bachelors degrees for 7.5%. The breakdown for non-science and technology staff is 18% Doctorates, 53% Masters, 25% Honours and 4% Bachelors degrees.

Vista University (Port Elizabeth) (VU).

This institution is unique in South Africa in that it was conceived of as a multi-campus university serving the needs of urban black communities under the previous government. It was established in 1981 and accepted the first students in 1983 (Vista University, 1999). The university has a Central Campus in Pretoria and seven others in Bloemfontein, Davyton (near Springs), Port Elizabeth, Sebokeng (near Vanderbijlpark), Soweto, Vista University Distance Education Campus (VUDEC) in Pretoria, and in Welkom. The present study deals only with activities at the Port Elizabeth campus which was officially opened in 1992. In 2000 there were 2700 students enrolled at the Port Elizabeth campus.

Staff profile.

Table 2.1 gives a breakdown of the total academic staff (96) by qualification. Those holding Masters degrees are in the majority at 41%, followed by Honours (26%), Doctorates (23%), and the remainder (Bachelors degrees and technical qualifications) 5% each. Academic staff engaged in science and technology work account for 25% of the total. Within this group 44% hold Masters degrees, 24% Doctorates, 20% technical qualifications and the remainder (12%) consists solely of Honours graduates. Among non-science and technology staff 41% hold Masters degrees, 30% Honours, 22% Doctorates and 7% hold Bachelors degrees.

2.4 Comparisons within and between the technikon and university sectors.

Table 2.1 provides interesting information on sectoral differences in the proportions of academic staff engaged in science and technology work. Analyses of the underlying frequencies indicate that technikons employ a significantly greater proportion of staff in science and technology than universities viz: 57% vs 36% (Chi square, $p < 0.0001$). This finding may not be surprising, yet a substantial proportion of technikon staff are engaged in non-science and technology work. In fact at one institution in the Eastern Cape 64% of the staff fall into this category. This is because many technikons offer secretarial and business courses in addition to, or even to a greater extent than, science and technology-related courses. Technikons differ from universities not only in relation to their science and technology course offerings, but also in the vocational nature of the training.

Further analyses of the data reveal that, at historically disadvantaged institutions (HDI's), a significantly smaller proportion of staff work in science and technology than at their historically advantaged counterparts (HAI's) viz: technikons 53% vs 60% (Chi square, $p < 0.0459$) and universities 30% vs 42% (Chi square, $p < 0.0001$). These anomalies owe much to the history and missions of the various institutions and to previous education policies, and are closely related to differences in the distribution of qualifications among academic staff. These differences are illustrated in Figures 2.1a and b which give breakdowns of qualifications of academic

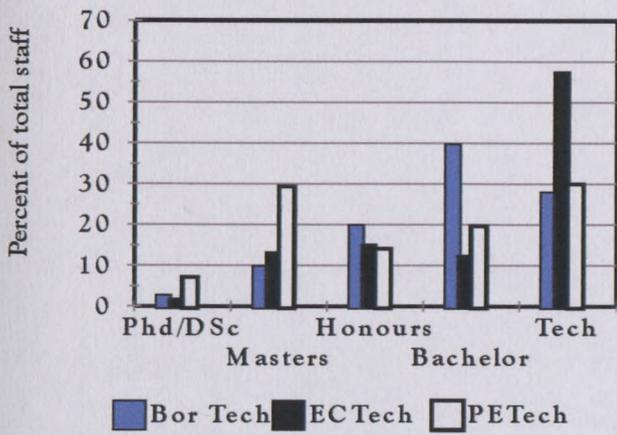


Figure 2.1a. Comparison of the distribution of qualifications among Total academic staff at the Port Elizabeth, Border and Eastern Cape Technikons.

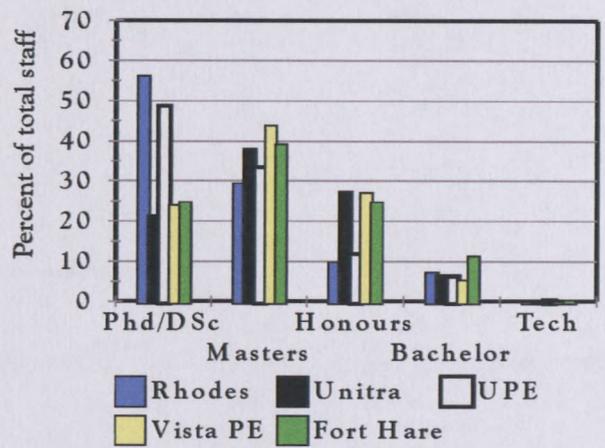


Figure 2.1b. Comparison of the distribution of qualifications among Total academic staff at the Universities of Rhodes, Fort Hare, Port Elizabeth, Transkei and Vista (PE).

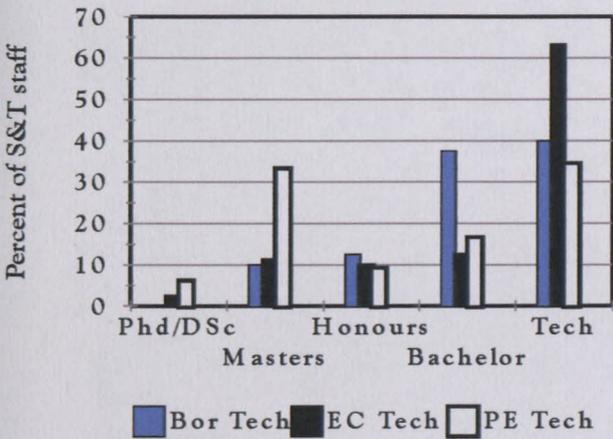


Figure 2.1c. Comparison of the distribution of qualifications among S&T staff at the Port Elizabeth, Border and Eastern Cape Technikons.

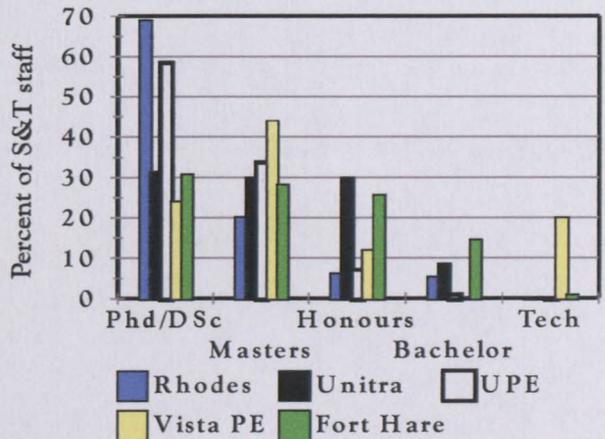


Figure 2.1d. Comparison of the distribution of qualifications among S&T staff at the Universities of Rhodes, Fort Hare, Port Elizabeth, Transkei and Vista (PE).

staff at technikons and universities in the Eastern Cape. After adjusting for differences in the sizes of academic staff, analyses reveal that the distribution of academic qualifications at universities is significantly skewed towards higher degrees, particularly Doctorates (Chi square, $p < 0.0001$). On average the proportion of Doctorates at universities is six times that at technikons, and there are approximately 2.5 times more Masters graduates and 1.7 times more Honours graduates at universities than at technikons. The only category in which technikons exceed universities is in the proportion of technically qualified staff which is 19 times that at universities. Similar sectoral differences exist within the science and technology staff category, and even within the non-science and technology category (Chi square, $p < 0.0001$ in both cases) (Figs. 2.1c to f).

Looking at differences between HDI's and HAI's, one sees a consistent trend emerging; disadvantaged institutions have significantly smaller proportions of doctorates than advantaged institutions. This is so for total staff viz. between technikons where HAI's have three times more doctorates than HDI's but one third of the proportion of Honours graduates (Chi square, $p < 0.0005$), between universities where HAI's have 2.3 times more doctorates than HDI's, but one third of the proportion of Masters graduates and two thirds of the proportion of Honours graduates (Chi square, $p < 0.0001$).

In the science and technology staff category the difference between technikons

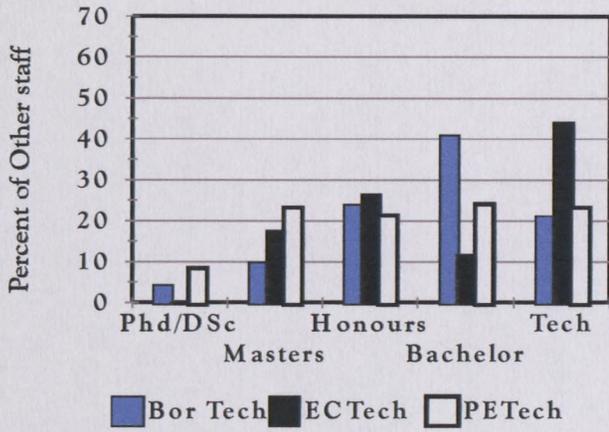


Figure 2.1e. Comparison of the distribution of qualifications among Other academic staff at the Port Elizabeth, Border and Eastern Cape Technikon.

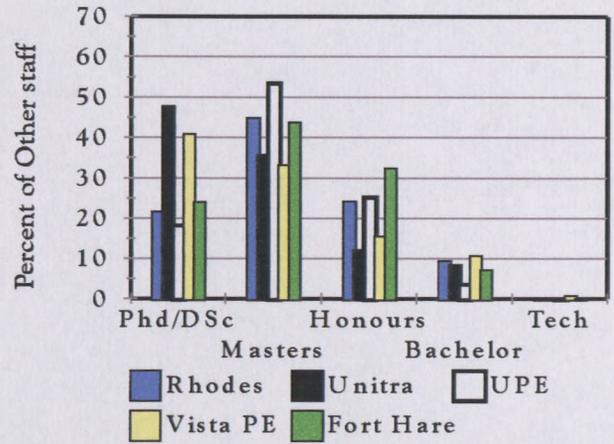


Figure 2.1f. Comparison of the distribution of qualifications among Other academic staff at the Universities of Rhodes, Fort Hare, Port Elizabeth, Transkei and Vista (PE).

is such that HAI's have 3.5 times more Doctorates but only one third of the proportion of Honours graduates compared to HDI's (Chi square, $p < 0.035$). Between universities the difference is that HAI's have 2.2 times more Doctorates, 0.75 times the proportion of Masters graduates and 0.3 times the proportion of Honours and Bachelors graduates found in HDI's (Chi square, $p < 0.0001$).

Within the non-science and technology staff viz. between technikons, HAI's have 3 times more Doctorates and twice as many Masters graduates than HDI's (Chi square, $p < 0.05$), and between universities HAI's have 2.2 times more Doctorates, 0.3 times the proportion of Masters graduates and 0.75 times the proportion of Honours graduates than HDI's (Chi square, $p < 0.0001$).

2.5 Discussion.

The differences in staff qualification profiles between technikons and universities presented in this study, although reflecting the situation in the Eastern Cape, mirror the national condition. In 1993, the most recent date for which national figures are available, the academic staff of universities comprised 41.3% Doctorates, 32.9% Masters, 17.8% Honours and postgraduate diplomas and 5.8% Bachelors degrees. Technical qualifications and undergraduate diplomas accounted for the remainder. At technikons the distribution was 2.1% Doctorates, 12.9% Masters, 25.8% Honours and postgraduate diplomas, and 16.6% Bachelors degrees.

Technikon and Undergraduate Diplomas accounted for 42.6% (FRD, 1996). These figures indicate that there were 20 times more Doctorates at universities than at technikons, 2.5 times more Masters graduates but only a third the number of Honours graduates.

The different roles that universities and technikons played in tertiary training has clearly contributed to the disparity in staff qualification structure. The FRD Science and Technology Indicators for 1996 (page 65) puts it this way:

“It must be born in mind that the orientation of technikon programmes is such that in appointing staff, preference has usually be given to those with practical experience gained in industry and that possession of a doctorate has been a secondary consideration.”

This is, however, changing as a result of the fact that from 1995 Technikons have been allowed to offer degree courses. Current figures for the Eastern Cape do indeed suggest a shift towards a more equitable distribution of highly qualified academic staff although there is still some way to go.

Unfortunately the same cannot be said about disparities in qualification profiles between HDI's and HAI's. In 1993 only 30.5% of academics at Historically Black Universities (HBU's) had Doctorates, compared with 52% at Historically White Universities (HWU's). Data from the Eastern Cape (this study) indicate that little has changed. At the University of Transkei, for instance, 22% of the academic staff in 1992 had Doctorates (Education Policy Unit, UWC, 1996) compared with 21% currently. To a large extent these figures reflect the traditional role that HBU's

have played in higher education. As a result of previous policies these institutions were largely undergraduate teaching universities. In 1992 the ratio of undergraduate to postgraduate enrolment at HBU's was 90:10 compared with 70:30 in HWU's. Furthermore only 15% of students at HBU's were studying science and technology courses compared with 40% at HWU's (Subotzky, 1997).

The situation may, however, have improved as regards the proportion of academic staff engaged in science and technology work at HBU's. Whereas in 1993 only 18% were involved in science and technology at HBU's (FRD, 1996), the data from the Eastern Cape suggest a significantly higher proportion (30%) currently. The degree to which this may reflect changes in science and technology, and higher education policies will be explored in the following chapters.



Chapter 3

Institutional Perspectives on Knowledge Production

3.1 Research administration.

The way in which an academic institution structures its research administration says much about its commitment to research as an academic enterprise. A well organized and efficient research administration will stimulate research and encourage funding while an inefficient structure will have the opposite effect. A meaningful interpretation of research activity at such an institution therefore requires an understanding of its research administration. What follows is an overview of research administration structures used by the various higher education institutions in the Eastern Cape. The information was obtained during interviews with research administrators and supplemented by information from the 1999 prospectuses.

Port Elizabeth Technikon (PET).

This institution conducts applied and developmental research in fields such as alternative energy; corrosion technology, maintenance engineering; rubber technology and catalytic chemistry. Research is represented at senior management level by the Vice Rector: Research and Institutional Planning, supported by a Unit

for Research Development with a Director. Policy and day-to-day administration is implemented through a Research Committee, chaired by the Vice Rector with representatives of the various faculties as well as the Vice Rector: Academic, Director of the Unit for Research Development, and the Heads of Library Services, Student Affairs, Industrial Liaison, and Student Support.

Border Technikon (BT).

Research is in its infancy at this institution and is administered by an Institutional Research Committee within the Strategic Planning Office. There are also Faculty Research Committees. Science and technology-related research is conducted in the fields of computing, chemistry and engineering among others.

Eastern Cape Technikon (ECT).

Research is also a relatively recent activity at this institution and, like the Border Technikon, no dedicated structures exist for its administration. At present research activities are administered by the Directorate of Staff Development. Technological research is undertaken in Engineering and Information Technology.

Rhodes University (RU).

There is a long tradition of research which is undertaken in all faculties.

Research is administered through an Office of Dean of Research (DOR) and a University Research Committee chaired by the DOR. In addition to the Director of Finance, this committee also has academic and student representatives. There are also faculty and departmental research committees.

University of Fort Hare (UFH).

There is also a long history of research at Fort Hare and numerous projects are running in most of the faculties, particularly in Arts, Agriculture and Science. Research is administered through a Dean of Research and a Research and Development Committee. The Committee is chaired by the Deputy Vice Chancellor (Academic) and consists of the Dean of Research, two Senate representatives on Council, Faculty representatives, representatives from Finance and SAPSE and the Director of the Agricultural and Rural Development Research Institute. Arts has a Faculty Research Committee, but there are no departmental research committees.

University of Port Elizabeth (UPE).

Research has always been a feature of this institution and active programmes are running in all of the faculties. Research administration is effected through a Dean of Research (DOR) and a University Research Committee chaired by the DOR and

consisting of the Vice Chancellor and faculty representatives. There are no official faculty or departmental research committees.

University of Transkei (UTR).

Since its inception, research has always been an important activity at Unitra and covers a wide range of fields from Humanities to Health and Natural Sciences. Administration of research is effected through an office of Dean of Research and a University Research Committee chaired by the Dean of Research. The committee consists of the Deputy Vice Chancellor, Chief Librarian, Registrar of Finance, Faculty representatives and the Director of the Research Resource Centre. Each faculty has a Research Committee chaired by a member of the Faculty Executive.

Vista University (Port Elizabeth) (VU).

Research activity is a relatively recent phenomenon in Port Elizabeth and is administered through a Dean of Research who chairs a central Research Committee which meets in Pretoria. Other members are the Deputy Vice Chancellor (Academic), Faculty representatives and Directors of Management Information Systems and of Institutional Development. A summary of the type and composition of research administration structures is given in Table 3.1.

Table 3.1 Officials and structures employed in research administration in higher education institutions in the Eastern Cape.

Structure	PET	BT	ECT	RU	UFH	UPE	UTR	VU
VC	√		√			√		
DVC (Res)	√	√			√		√	√
DOR	√	√	√	√	√	√	√	√
Other		√	√					
IRC	√	√		√	√	√	√	√
FRC's		√		√	√		√	
DRC's				√				
Composition of IRC								
VC						√		
DVC (Res)	√	√			√		√	√
DOR	√			√	√	√	√	√
Deans	√						√	
Fac. Reps	√	√		√	√	√	√	√
Other Acads.				√	√			
Dir. Finance				√			√	
Dir. Comp.								
Serv.								√
Librarian	√	√					√	√
Other Dirs.	√						√	√
Students				√				

VC = Vice Chancellor/Rector; DVC = Deputy Vice Chancellor/Rector; DOR = Dean/Director of Research; IRC = Institutional Research Committee; FRC = Faculty Research Committee; DRC = Departmental Research Committee.

All but two of these institutions have a Dean/Director of Research and all but one have an Institutional Research Committee. All but one have at least nominal involvement of senior management either at the level of Vice Chancellor/Rector or Deputy VC/Rector. It is interesting, however, that without exception, the position of Dean/Director of Research, even if substantive, is a recent phenomenon. This position was created at PET in 1996, at Rhodes in 1998, at UPE a (temporary) position was created in 1999, at Unitra in 1996 and at Vista also in 1999. Prior to this these institutions managed research through a research committee chaired on a part time basis by senior academics. This position is filled part time at Fort Hare, Border Technikon and Eastern Cape Technikon.

In most cases research management structures stop at the level of an institution-wide committee. Only four have faculty committees and only one has departmental research committees. The composition of the institutional committee varies, although most have representation from the Rectorate and are chaired by the Director/Dean of Research. There are also usually faculty representatives, and four have the Librarian as well. Only two have Deans and/or Director of Finance on their research committees, which is surprising considering the financial implications of research activity. Only one institution has student representatives on its research committee.

Staffing levels in offices of Dean/Director of Research vary considerably.

Seven categories of staff were identified in the survey (Table 3.2). Staff vary between one and four (apart from the DOR) with an average around two. Only one institution has financial expertise within the DOR office, and only one has an assistant or deputy DOR.

Table 3.2. Staffing in offices of Dean/Director of Research in higher education institutions in the Eastern Cape.

Position	PET	BT	ECT	RU	UFH	UPE	UTR	VU
Dean/Director of Research	√	√	√	√	√	√	√	√
Assistant DOR				√				
Administrator					√		√	√
Secretary	√	√	√	√	√	√		√
Finance Manager	√							
Research Officer	√					√		
Asst. Res. Officer	√					√		

Figure 3.1 gives a generalized scheme of research management showing the minimum configuration characteristic of most of these institutions.

3.2 Institutional research policy and related issues.

When asked whether their institution had a clear research policy, all technikons responded that such a policy existed. However, only three of the

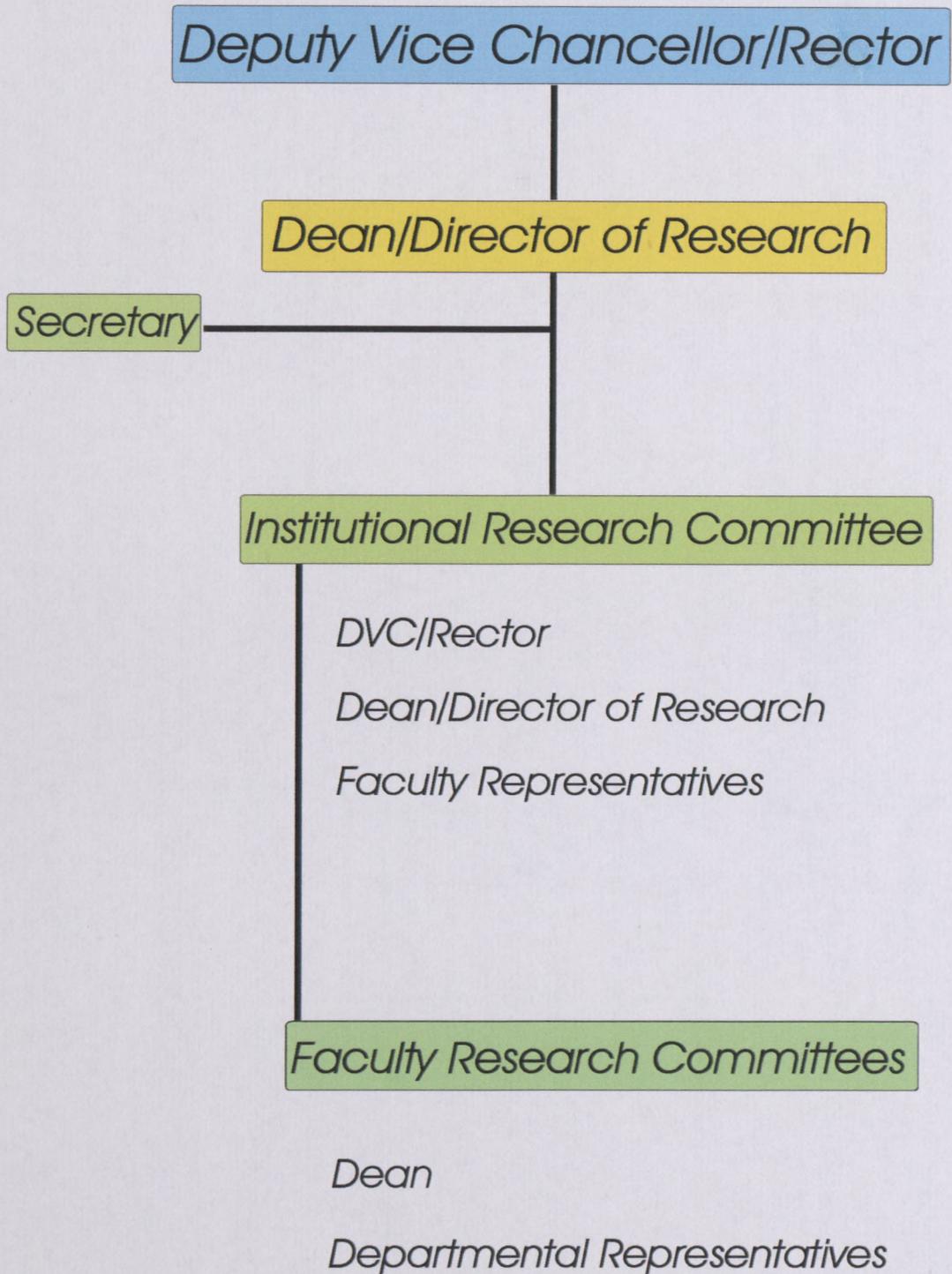


Figure 3.1. Generalised scheme of research management in higher education institutions in the Eastern Cape.

universities responded in this way. All three technikons said that their policy was to encourage research but only one said that they had actually done anything concrete to put this into effect. Similarly, among universities, only two institutions reported concrete moves in this regard. Of all eight institutions only one, a technikon, indicated that research was considered a significant priority. Administrators at the other institutions felt that research was not considered by their management structures to be a priority. One administrator put it this way “Research is important but our priority is to increase student enrolment and develop more relevant curricula”

Five of the institutions indicated that their research policies had changed over the last five years. They indicated that the changes had been both in terms of philosophy and attitude towards research as well as in its management. Six categories of change were identified in the survey viz. establishment of DOR; administrative changes (new committees etc); more resources for research; greater emphasis on research; more direction from management and development of a research culture.

All technikons said that there was now a greater emphasis on research and two said that more resources had been devoted to this activity. One said that there was now a greater sense of direction to research and a growing research culture on the campus. Reasons given for these changes were external factors such as government policy and the need to be more competitive. One respondent said that the degree-

awarding status of technikons required a more research-oriented culture.

Among universities there was a definite air of gloom when it came to research. Although four of the five said that there had been structural changes in research management (eg. appointment of a DOR), and there was now greater emphasis on research, it was notable that with one exception, all said that no additional resources had been made available for research, and one said that there were in fact less resources at his institution than there had been. Said one administrator *"We are going backwards as far as research is concerned because we have not maintained the necessary infrastructure."*

Only one institution reported a positive development of a research culture in recent years.

Where reasons for positive changes were given (by two institutions) these related to changes in institutional and government policy, and to external factors such as the need for competitiveness and new funding opportunities arising from foreign involvement in the country. The categories of reasons for changes to research policy were changes to institutional policy; changes in government policy; external factors such as responsiveness to community needs, and the new degree-awarding status of technikons, and other factors such as the establishment of Centres of Excellence. No reasons were given for negative changes beyond a general reduction in funding and infrastructure.

University administrators mentioned the establishment of a DOR and administrative changes which place greater emphasis on research, but HBU's also cited more resources for research, more direction from management and the development of a research culture as changes that had occurred. These were not mentioned by administrators at HWU's. There was no difference in responses from administrators within the technikon sector. No reasons were given for changes to research policy by administrators at HWU's but those at HBU's said that these were driven by changes in government policy and external factors such as responsiveness to community needs and the establishment of Centres of Excellence and Research Resource Centres¹. Again there were no differences between technikons regarding perceived reasons for changes to research policy.

Two of the questions common to administrators and researchers explored their familiarity with the contents of the White Papers on Science and Technology and on Higher Education Transformation. A five-point Likert scale was used with 1 being unfamiliar and 5 being very familiar. The overall average score as well as those within each sector are shown in Figures 3.2 a and b. On average administrators demonstrated a surprisingly poor knowledge of science and technology policy beyond an appreciation that this was favoured by the government. Their knowledge of higher education policy was somewhat better at 3.29 (Fig. 3.2a). University

¹These were established with CSD funding at Fort Hare and Unitra.

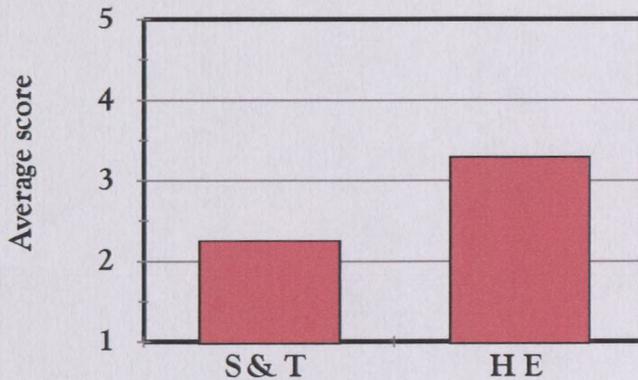


Figure 3.2a. Overall average scores by administrators for their knowledge of the White Papers on Science and Technology (S&T) and on Higher Education Transformation (HE).

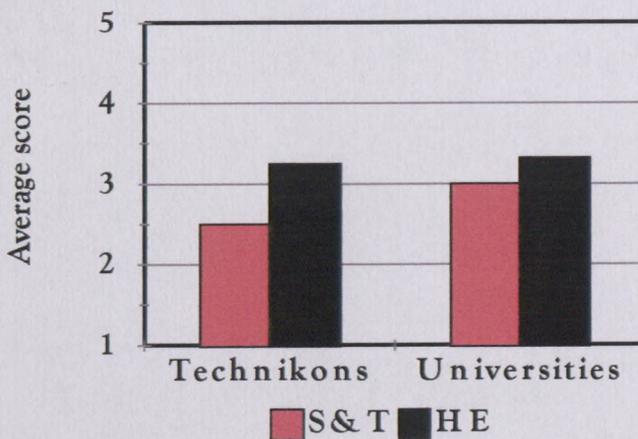


Figure 3.2b. Overall average scores by technikon and university administrators for their knowledge of the White Papers on Science and Technology (S&T) and on Higher Education Transformation (HE).

administrators tended to have a slightly better knowledge of S&T policy than their technikon counterparts although the difference was not significant. There was also no difference between these two groups in their knowledge of higher education policy.

3.2.1 Research funding.

The administrator questionnaire contained several questions relating to research funding. In response to a question on the use of the block grant for research (applicable only to universities) two institutions reported that these funds went into the general account and were not used specifically for research. Surprisingly, three research directors responded that they did not know what happens to this money and two of these were unaware that a block grant for research even existed! At least one technikon research director felt that the block grant for research discriminated against technikons.

Another question sought information on the disbursement of the SAPSE publication subsidy. Policies in regard to this vary considerably between institutions. There is, however a distinction between technikons and universities in this regard, the former paying on average 61% to the author's research account while the latter pay only 23%. Two of the technikons also gave the author the option of being paid personally 75% of the subsidy (subject to taxation). There is also a distinction

between HWU's and HBU's in this regard, the former retaining an average of 95% of the subsidy for their main accounts and giving only 5% to the author's research account, while the latter retained only 40% and gave 28% to the author's research account and 16% to the author's department. The remaining 16% is paid to the author personally. One university diverts 5% of the subsidy to a general Research Development Fund. There are no significant differences in disbursement of publication funds within the technikon sector.

Turning to internal research budgets, two technikons and two universities reported that internal budgets for research are determined on the basis of historical usage. One technikon and three universities said that their DOR draws up the research budget in consultation with the DVC/Rector. Only one institution has a budget committee for research. Three of the universities also involve the Financial Manager in the budgeting process. No *a priori* division of funds is made between Natural and Human Sciences and research funds are allocated on the basis of demand.

Figure 3.3a shows the 1999 average total research budgets for the technikon and university sectors in the Eastern Cape. Technikons generally spend less on research than universities although there is a large variation (Rm0.3 to Rm7.5). University budgets vary from Rm1.8 to Rm8.5. The two sectors differ in their dependence upon external funding with technikons contributing a larger proportion

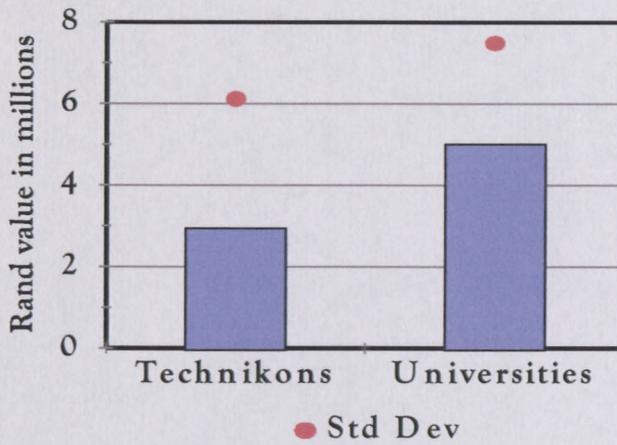


Figure 3.3a. Mean total research budget for 1999 for technikons and universities in the Eastern Cape.

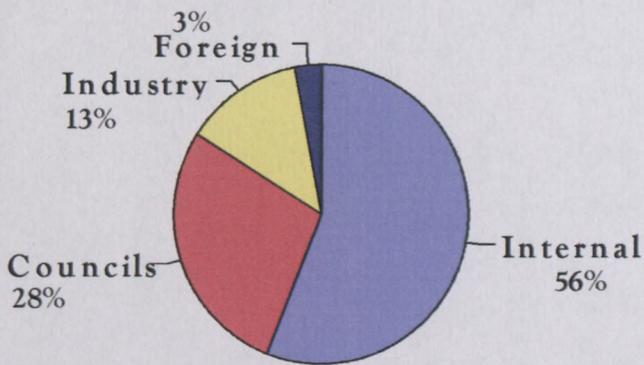


Figure 3.3b. Sources of research funding in technikons in the Eastern Cape in 1999.

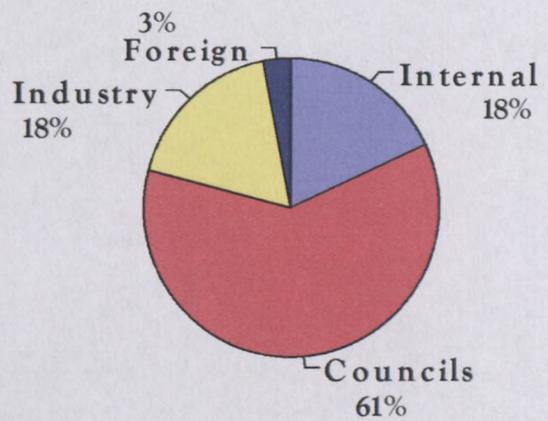


Figure 3.3c. Sources of research funding in universities in the Eastern Cape in 1999.

of their internal budgets to research (56%; range 33-70%) than universities (18%; range 0-33%). The former depend on funding councils (principally the NRF) for 28% of their research budgets as opposed to 61% at universities. Both sectors receive approximately the same proportion of their research funds from foreign sources but surprisingly, universities receive on average 18% of their research funds from industry compared to only 13% in technikons (Figs. 3.3b and c). HWU's on average cover 29% (range 25-33%) of their research budgets from internal sources compared to less than 3% (range 0-5%) at HBU's (Figs. 3.3d and e).

When asked whether their internal research budgets had changed over the last five years, Eastern Cape and Border Technikons responded that it had increased and ascribed this to changes in institutional policy which now places more emphasis on research. Port Elizabeth Technikon said that their research budget had remained about the same. The picture was different at universities where only UPE reported an increase in research spending over the last five years. Rhodes University said that spending had remained constant while both Unitra and Fort Hare said that there had been a significant decrease in recent years², which they ascribed to general budget cuts. The greatest decreases in research funding occurred in the HBU sector.

One administrator said,

"There appears to be a belief here that research can be supported entirely through external funds. This

²One university (Vista) could not supply this information.

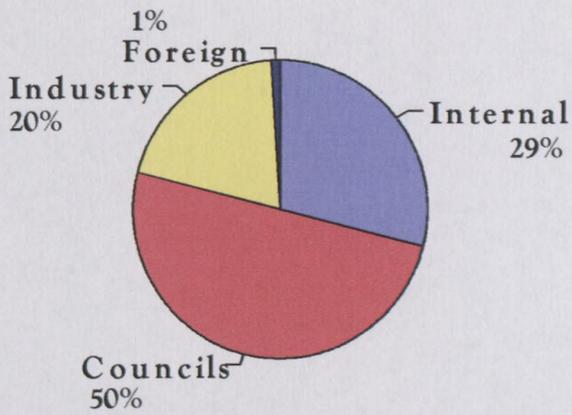


Figure 3.3d. Sources of research funding in historically white universities in the Eastern Cape.

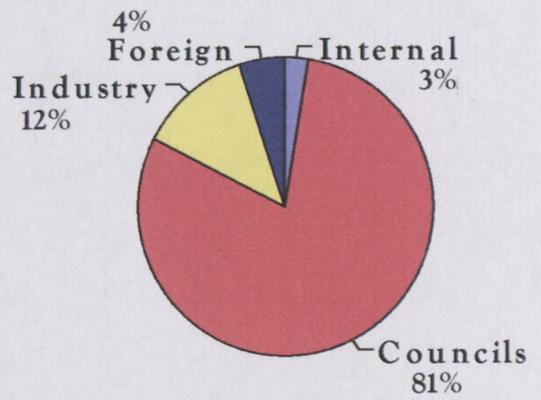


Figure 3.3e. Sources of research funding in historically black universities in the Eastern Cape.

ignores the fact that most funders expect the institution to provide basic infrastructure from their block grant. We have external grants that can't be used because the infrastructure is either unavailable or unusable."

When asked whether there had been a change in the sources of funds, respondents from technikons said that there had been a shift to internal funds away from other sources. One technikon said that there had been no change. The reasons given were changes in institutional policy and in one case a perception that funding council support had waned. Universities, on the other hand, responded that general internal budget cuts had reduced internal research spending, forcing them to rely more on funding councils and industry support.

The survey revealed that there were five procedures used by these institutions in allocating research funds from internal budgets, although not all of these were used at each institution. These were minimum qualifications, application forms, faculty evaluation, DOR evaluation and external evaluation. With one exception technikons preferred to leave the evaluation up to either faculty research committees, if they existed, or to the DOR. Only one university had a minimum academic qualification (Honours) requirement. All the universities and one technikon used some form of application form, while only one university made use of external evaluators.

When asked how they ensure quality control, four of the universities and one technikon said this was the responsibility of their institutional research committee.

Only one institution in each sector left this to the DOR, and only one university used external assessors. One technikon and two universities indicated that faculty-level assessment was also used.

3.2.2 Nature of research.

Administrators were asked to estimate the proportion of their institution's research that could be considered as basic, strategic or applied. As would be expected most (83%) of the research at technikons is applied in nature with 12% classified as strategic and only 5% as basic (Fig. 3.4a). University research, on the other hand, was fairly evenly distributed across the three types with 36% classified as applied, 28% as strategic and 35% as basic (Fig. 3.4b). None of the technikons indicated that these proportions had changed over the last five years while 3 of the universities indicated that there had been a significant shift from basic to applied in that time. Although information on historic proportions is not available for technikons and universities separately, Mouton (1998) gives figures for the natural sciences as a whole of 32% fundamental/basic research, 8.5% strategic and 16.2% applied around 1997. Administrators ascribed these changes to new government policies.

Most of the research at technikons (85%) was classified as single discipline-based (SD), compared with only 51% at universities (Figs. 3.4 c and d). The proportion of research classified as multi-institutional (MI) was 15% at technikons

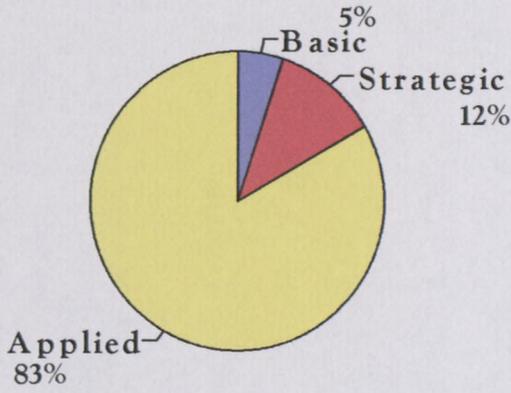


Figure 3.4a. Relative proportions of basic, strategic and applied research undertaken at technikons in the Eastern Cape.

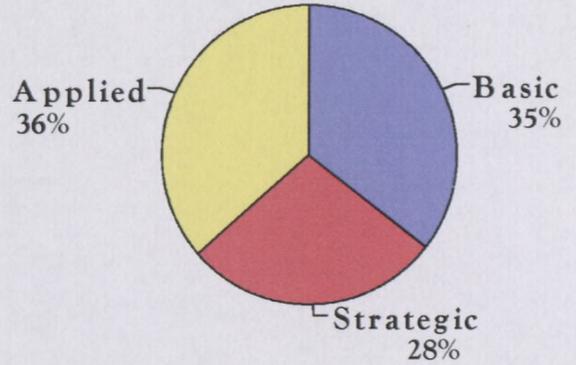


Figure 3.4b. Relative proportions of basic, strategic and applied research undertaken at universities in the Eastern Cape.

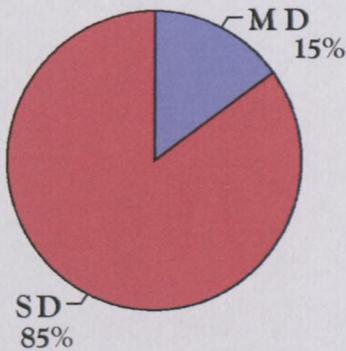


Figure 3.4c. Relative proportions of multi-disciplinary and single discipline-based research undertaken at technikons in the Eastern Cape.



Figure 3.4d. Relative proportions of multi-disciplinary and single discipline-based research undertaken at universities in the Eastern Cape.

compared with 31% at universities, while only 3% of research was classified as multi-national (MN) at the former compared with 22% at the latter (Fig. 3.4 e). One technikon and three universities indicated that there had been a shift towards multidisciplinary and multi-institutional research in the last five years, although historical data were unavailable. Two universities indicated a shift towards multi-national research.

Two universities cited changes in policy among funding agencies as a reason for the shift in research type, one mentioned that post graduate students now demand a multidisciplinary training, two said that increasing international exposure had changed the nature of research, while three said that funding opportunities for single discipline-based research were less than before. One Administrator was of the opinion that “The FRD [sic] is forcing us to do multidisciplinary and collaborative work if we want funds from them.”

There were no differences between historically black and white institutions in respect of the above.

3.2.3 *Research Outputs.*

Figures 3.5 a and b show two indicators of research activity at technikons and universities in the Eastern Cape. The first is the number of NRF-rated scientists

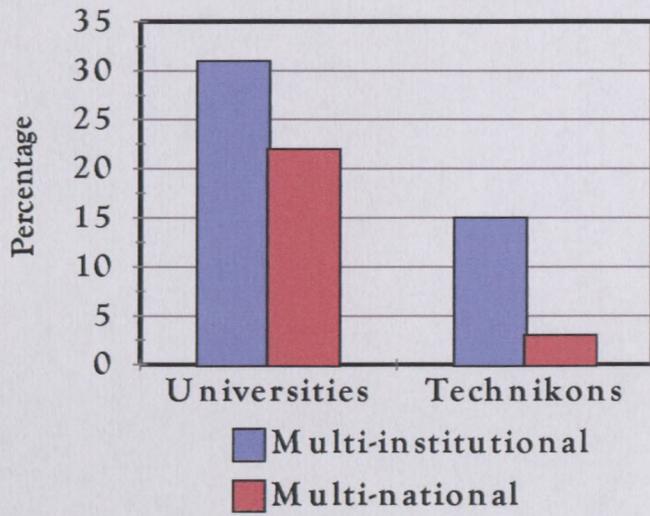


Figure 3.4e. Relative proportions of multi-institutional and multi-national research undertaken at technikons and universities in the Eastern Cape.

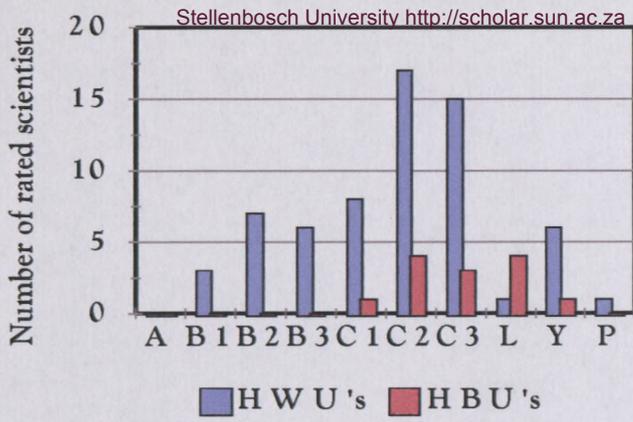


Figure 3.5a. Number of NRF-rated scientists by category at universities in the Eastern Cape.

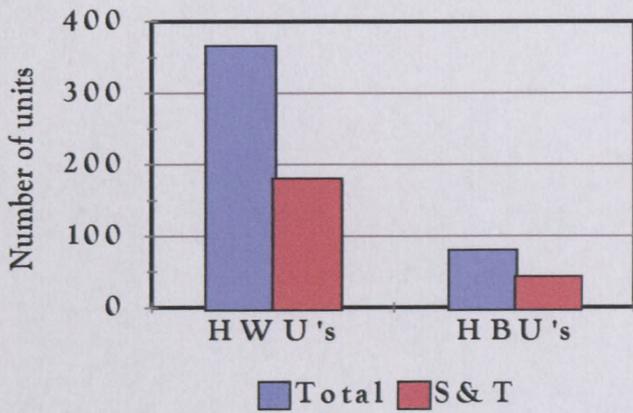


Figure 3.5b. Total SAPSE and S&T publication output by universities in the Eastern Cape (1998).

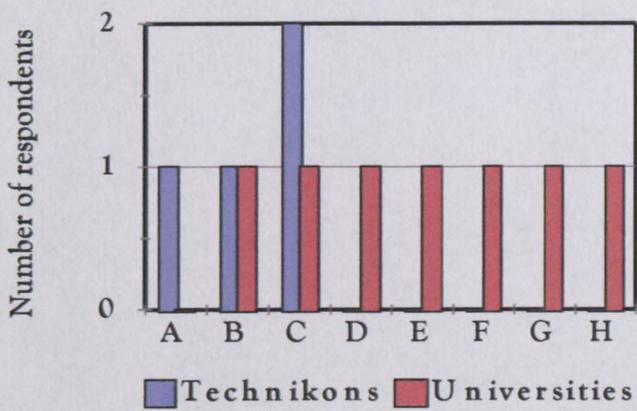


Figure 3.5c. Reasons given by technikons and universities for changes in publication output. (Key on page 3.17)

which in this study were found only at universities. HWU's had a significantly larger number of rated scientists (Rhodes: 36; UPE: 28) than HBU's (Unitra: 11; Fort Hare 2; Vista PE: 0) (t-test, $t = 2.68$, $p < 0.015$). Furthermore there were more highly rated scientists (B and above) at the former than at the latter.

The total number of SAPSE-accredited publication units, together with the proportion made up by S&T publications, at universities in 1998 are shown in Figure 3.5b. Of a total of 446 units 18% come from HBU's (Unitra: 80; Fort Hare: 14), while Rhodes University produced 119 and UPE 62 units. There was no difference in the proportion of S&T units produced by the two groups. Technikon output is low with only 15 units produced in 1998 (Port Elizabeth: 14; Border: 1). Two technikons said that there was an upward trend in output but only one university reported this. Two universities reported a downward trend in output and two said that there had been no change in recent years. The reasons given for these trends fell into two classes, positive and negative (see Box).

Positive:	Negative:
A: Institutional Policy	D: Little time for research
B: Agency policy	E: Changing student demography
C: Greater staff involvement	F: Static salaries
	G: No promotions
	H: Rationalization

As Figure 3.5c shows there were interesting differences in response between

technikons and universities with the former citing more positive reasons for change than the latter. One university cited changing student demography as a reason for reduced research output. As the number of students from disadvantaged backgrounds increased so has the amount of time that academic staff must devote to remedial work at the expense of research. Other reasons were related to the absence of incentives such as promotions, salary increases and rationalization leading to redundancies. Interestingly, there were no differences in response within the university sector, all were more or less equally despondent!

Figure 3.6a shows the total and S&T proportion (including Health Sciences and Agriculture where appropriate) of post graduate students produced by universities in 1999. The pattern is similar to that of publication output with HWU's producing the largest proportion of post graduates, 79% of a total of 885, although only 27% were in science and technology. HWU's produce proportionally more S&T post graduates (29%) compared with 21% at HBU's. Post graduate output from technikons was very low (10 MTech students in 1998) due to the fact that these institutions were awarded degree status only in 1993.

Supplementary information on temporal trends in output.

Additional data on historical output of post graduates from 1995 to 1999 in all faculties, and on total SAPSE output from 1995 to 1998, were obtained from

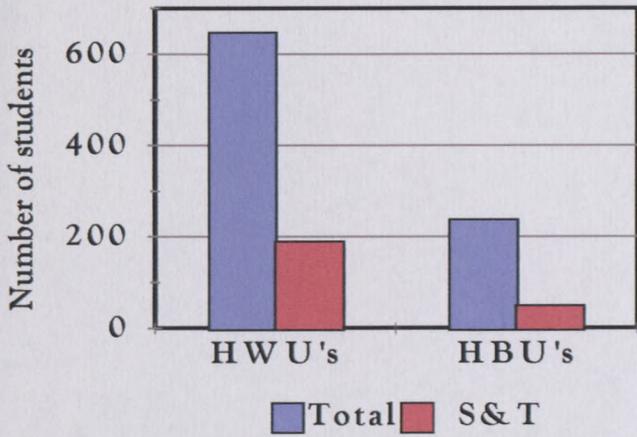


Figure 3.6a. Total and S&T proportion of post graduates produced by universities in the Eastern Cape (1999).

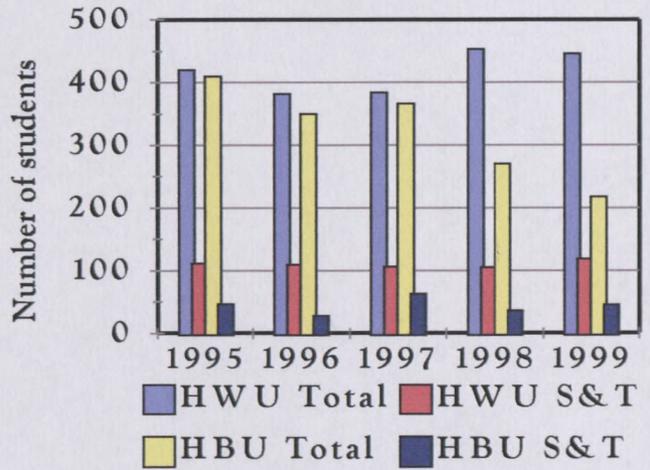


Figure 3.6b. Total and S&T proportion of Honours graduates produced by universities in the Eastern Cape.

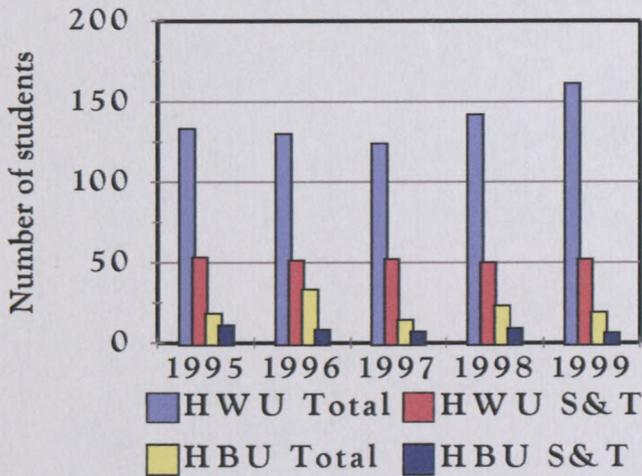


Figure 3.6c. Total and S&T proportion of Masters graduates produced by universities in the Eastern Cape.

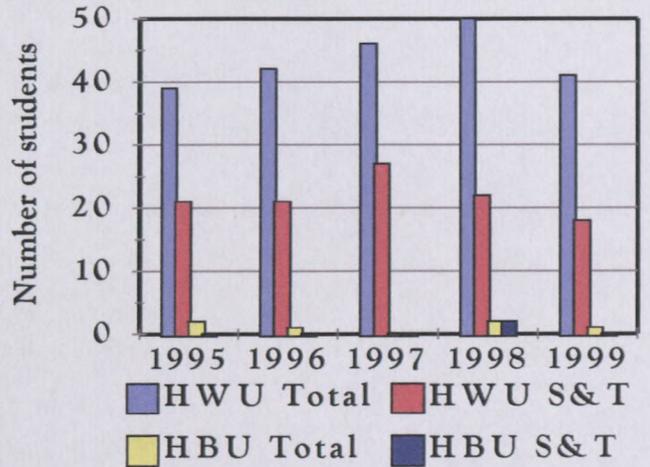


Figure 3.6d. Total and S&T proportion of Doctoral graduates produced by universities in the Eastern Cape.

Directors of Research at Rhodes, UPE, Fort Hare and Unitra. Vista (PE) is expected to start post graduate courses in science in 2000. Figure 3.6b shows the total number of Honours graduates, and the proportion in science, produced in the last five years. HWU's produced a total of 2083 Honours graduates in that time, of which 26% were in science, as opposed to 1613 from HBU's where 13.5% were in science. These proportions have remained fairly constant at HWU's and although there has been a decline in total output from 1997 at HBU's, the number of science graduates has remained constant.

Figure 3.6c shows the figures for Masters graduates. Again the HWU's dominated in terms of output, producing a total of 690 Masters graduates of which 37.4% were in science. At HBU's the equivalent figure is 107 of which 38% were in science. The discrepancy in output of Doctoral graduates is substantial (Fig. 3.6d) with HWU's having produced a total of 218 graduates with 50% in science, and HBU's producing only 6 of which a third were in science.

Figures 3.7 a to d show changes in SAPSE publication output by faculty at Rhodes, UPE, UNITRA and Fort Hare respectively. Data for Vista in Port Elizabeth specifically were not available. HWU's consistently produce two to three times more publications than HBU's. Interestingly, however, in both cases it is the faculties of Arts and Science that dominate output and in 1998 the Science faculties at all four universities accounted for the largest proportion of publications, 51% at HWU's and

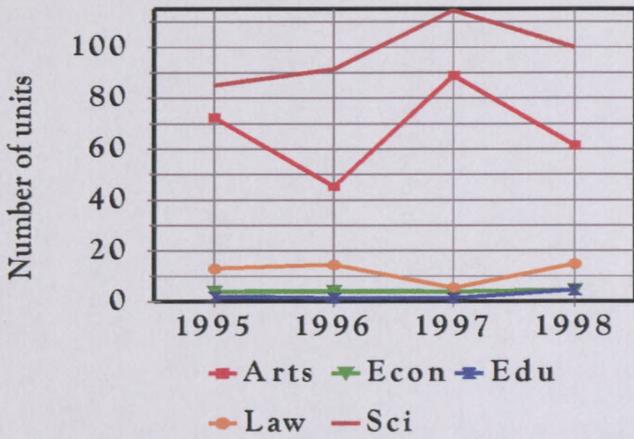


Figure 3.7a. SAPSE publication output by faculty (1995-1998) at Rhodes University.

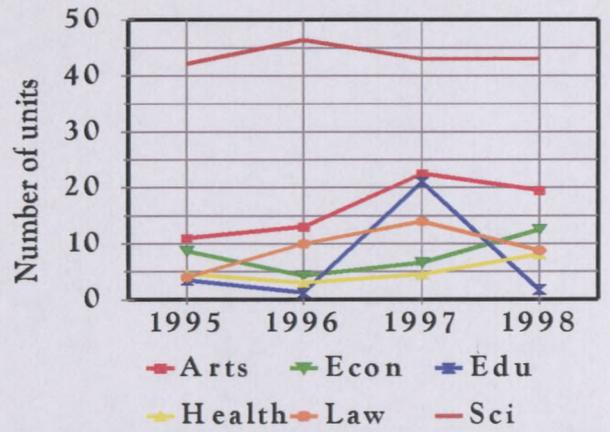


Figure 3.7b. SAPSE publication output by faculty (1995-1998) at the University of Port Elizabeth.

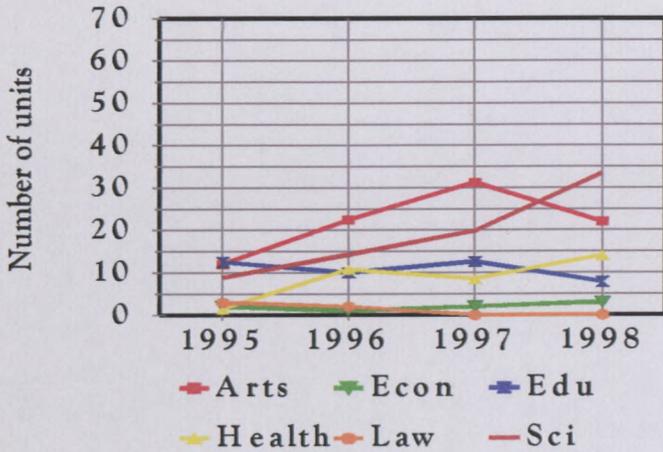


Figure 3.7c. SAPSE publication output by faculty (1995-1998) at the University of Transkei.

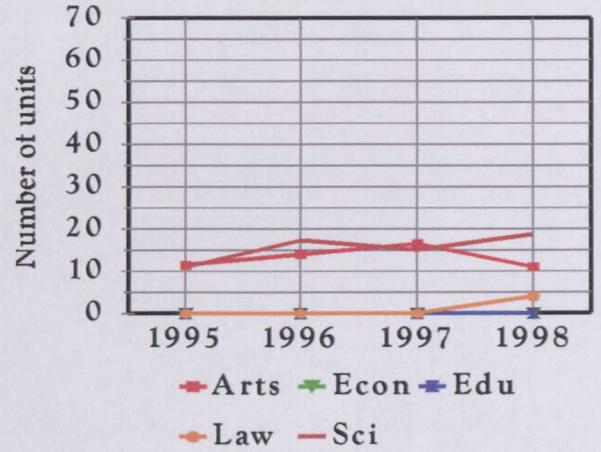


Figure 3.7d. SAPSE publication output by faculty (1995-1998) at the University of Fort Hare.

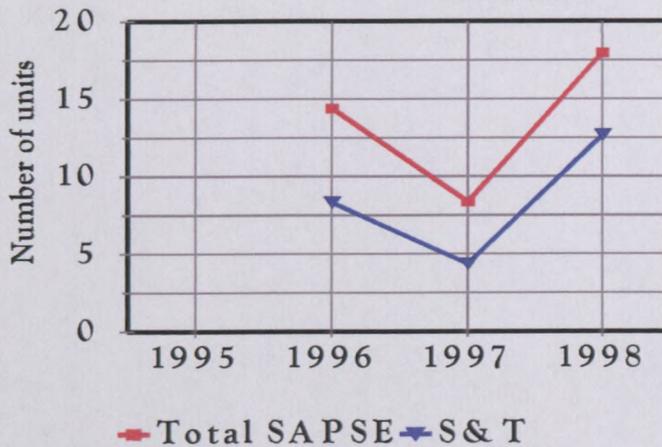


Figure 3.7e. Total SAPSE and S&T publication output (1996-1998) at technikons in the Eastern Cape.

46% at HBU's. The proportion of science publications rose at HBU's from 32% in 1995 to 46% in 1998, but remained constant at 51% at HWU's. Another interesting trend is that while total outputs from HBU's almost doubled between 1995 and 1998 (62 to 114 units), output from HWU's increased by only 12% from 250 to 279 units. Figure 3.10e shows the output for technikons over the period from 1996 to 1998 for which data were available. Although overall output is considerably lower than for the university sector, there is an upward trend. As would be expected publications in science and technology account for most of the production (57 to 70%).

Figures 3.8 a to f show variations in output of Honours, Masters and Doctoral graduates from 1995 to 1999 at Rhodes and UPE. The number of Honours graduates in arts at Rhodes has fallen by 30% since 1995 while the number of graduates in economics has doubled. Science output at Honours level has, however, remained fairly constant. The only growth in Honours graduates at UPE was in health sciences, output from the other faculties having remained close to their 1995 levels. In contrast Rhodes experienced a substantial growth in Masters graduates in both arts and science over the last five years. UPE, on the other hand experienced a 15% decline in the number of science Masters graduates between 1995 and 1999 and a doubling in the output of Masters graduates in Arts. There were no trends in the number of Doctoral graduates at Rhodes but the number of Doctorates in science fell by 50% at UPE between 1995 and 1999.

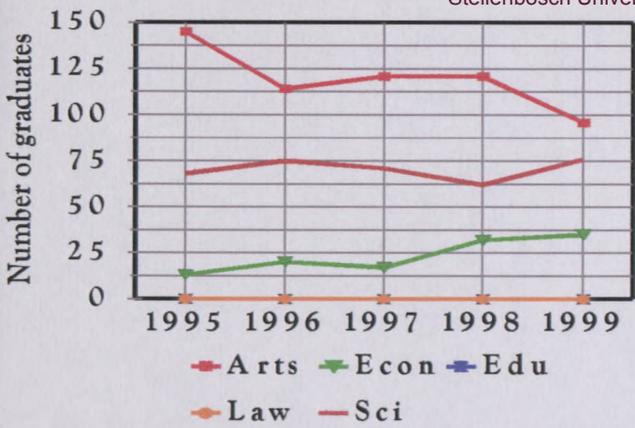


Figure 3.8a. Honours graduate output by faculty (1995-1999) at Rhodes University.

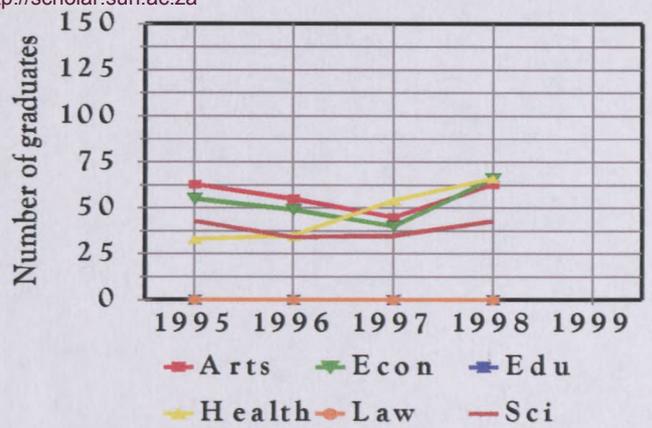


Figure 3.8b. Honours graduate output by faculty (1995-1999) at the University of Port Elizabeth.

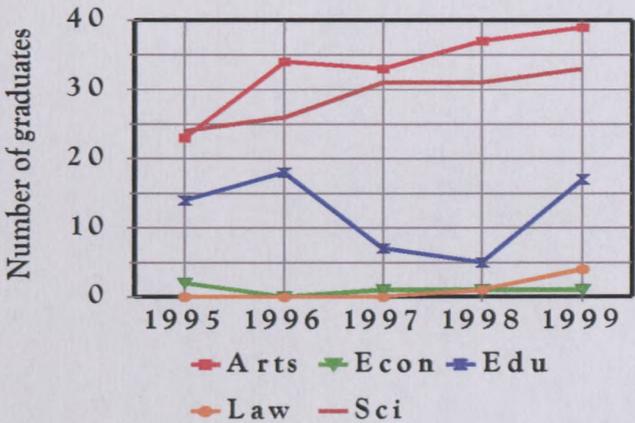


Figure 3.8c. Masters graduate output by faculty (1995-1999) at Rhodes University.

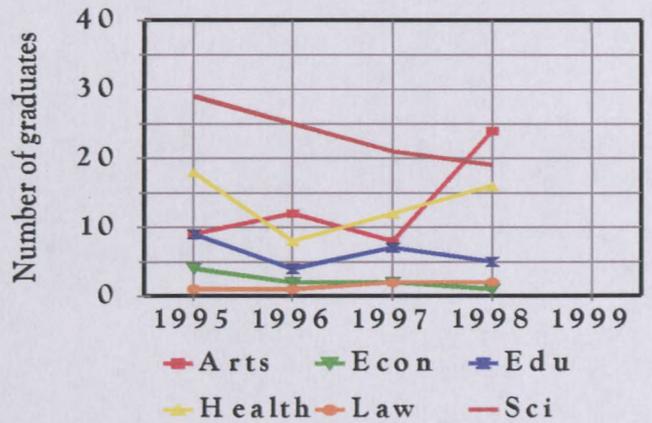


Figure 3.8d. Masters graduate output by faculty (1995-1999) at the University of Port Elizabeth.

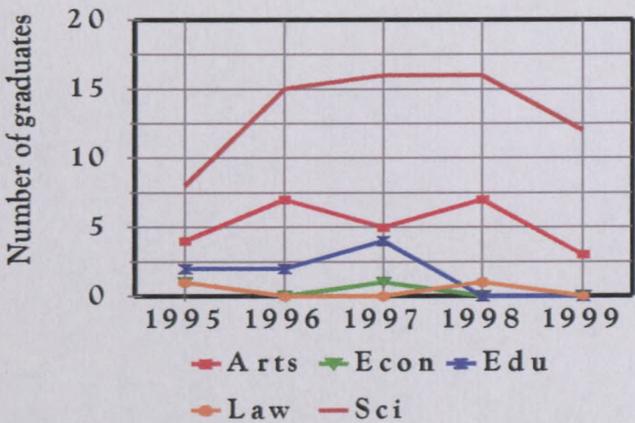


Figure 3.8e. Doctoral graduate output by faculty (1995-1999) at Rhodes University.

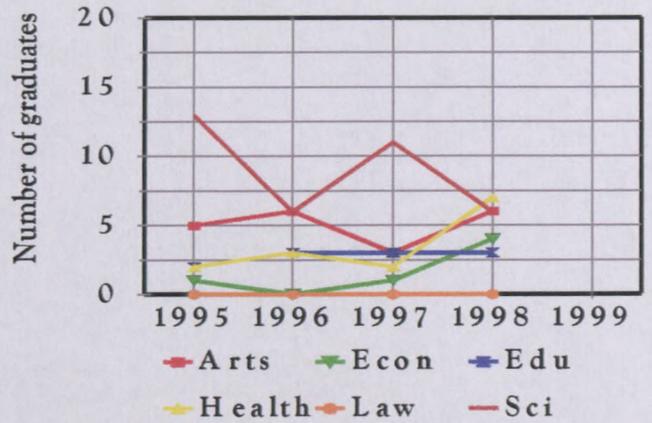


Figure 3.8f. Doctoral graduate output by faculty (1995-1999) at the University of Port Elizabeth.

Post graduate output for the Universities of Transkei and Fort Hare are shown in Figures 3.9 a to f. Production of Honours graduates has fallen dramatically at both institutions in the last five years. This trend is most evident in the faculties of education and also in arts at Fort Hare where reductions of up to 50% have occurred. The number of science Honours graduates (including agriculture at Fort Hare) has, however, remained fairly stable during this period. As a result of these dynamics the proportion of S&T Honours graduates has risen from 4.4% to 13.1% at Unitra and from 16.6% to 27.9% at UFH.

The production of Masters graduates has also fallen over the last five years, mainly in education at Unitra and in arts and science at Fort Hare. At both universities the proportion of S&T Masters graduates has halved over this period, from 66.6% to 33.3% at Unitra and from 58% to 28.6% at UFH. Numbers of Doctoral graduates are too small for meaningful analysis.

Comparison of post graduate output of HWU's and HBU's indicated that the former produce about twice the number of Honours graduates, eight times the number of Masters graduates and twenty times the number of Doctoral graduates than the latter. Significantly more Honours education graduates were produced at HBU's (902) than at HWU's (10) during this period. Although there was no statistically significant difference in the number of Honours science graduates produced by these two sub-sectors ($t = 1.79$, $p < 0.1$), the HWU's did produce

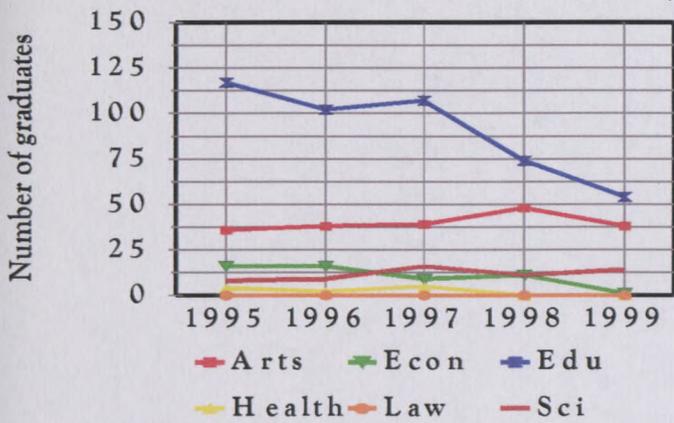


Figure 3.9a. Honours graduate output by faculty (1995-1999) at the University of Transkei.

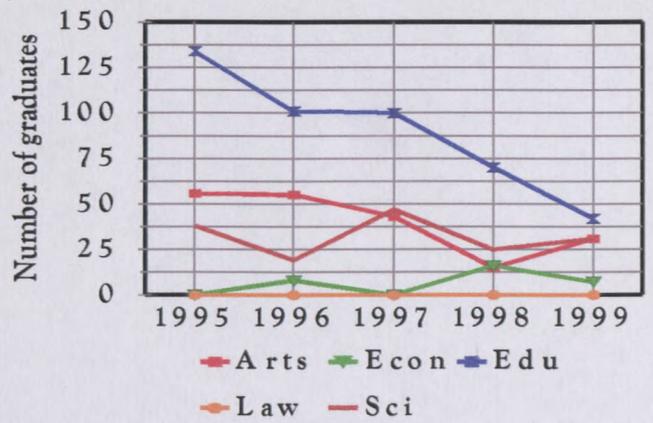


Figure 3.9b. Honours graduate output by faculty (1995-1999) at the University of Fort Hare.

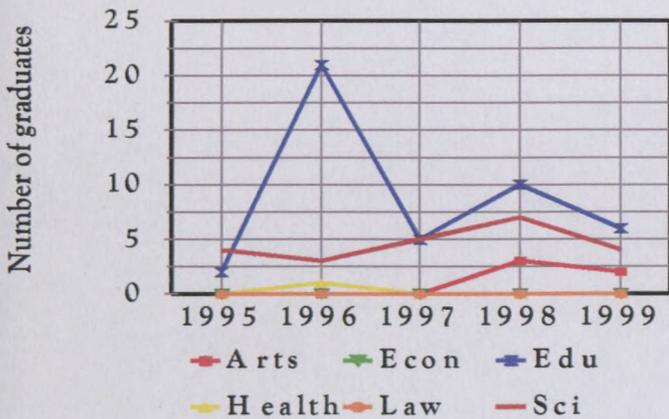


Figure 3.9c. Masters graduate output by faculty (1995-1999) at the University of Transkei.

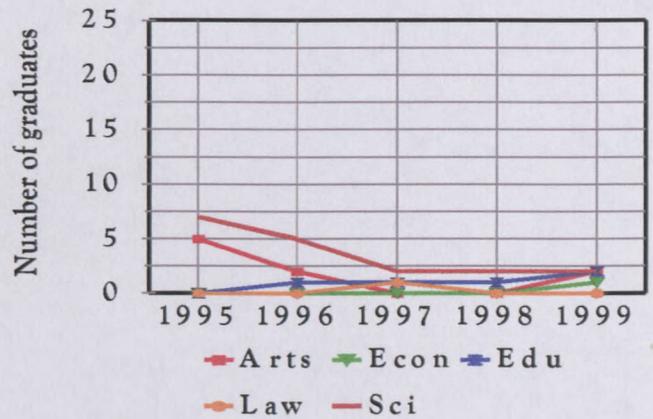


Figure 3.9d. Masters graduate output by faculty (1995-1999) at the University of Fort Hare.

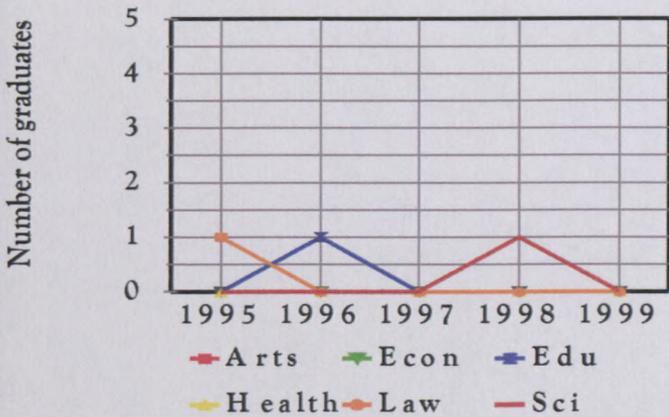


Figure 3.9e. Doctoral graduate output by faculty (1995-1999) at the University of Transkei.

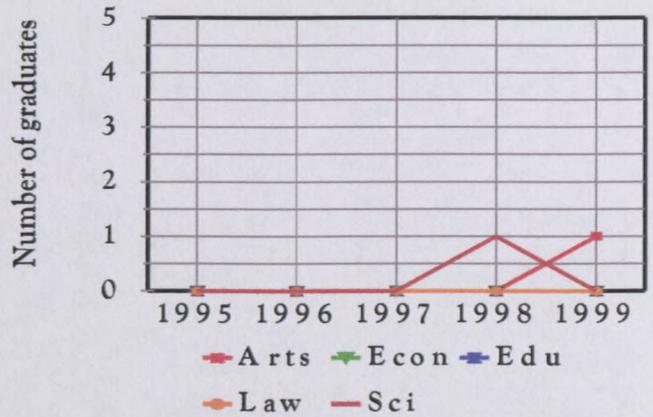


Figure 3.9f. Doctoral graduate output by faculty (1995-1999) at the University of Fort Hare.

significantly more Masters ($t = 9.64$, $p < 0.01$) and Doctoral ($t = 4.58$, $p < 0.03$) graduates in science.

Figure 3.10 shows the total and proportion of science and technology post graduates produced by technikons in the Eastern Cape from 1996 to 1999. Considering the relatively short time that technikons have been able to award degrees, output of MTech graduates has been good and there is a clear upward trend. Graduates in science and technology initially accounted for all of the output, but this decreased to 66% in 1999.

3.3 Discussion.

It is perhaps surprising, in view of the important role that institutions of higher learning play in knowledge production, that research management at the HEI's in this survey was until recently (and still is in some cases) a rather *ad hoc* activity. Even at long-established institutions with a tradition of excellent research, units with personnel assigned specifically to the task of managing research are a recent phenomenon. Certainly most institutions, particularly universities, had some structures that dealt with research, usually a central Research Committee with faculty representation. There was, however, little attempt at strategic planning or steering of research by management until recently.

The majority of research administrators at the universities surveyed cited the

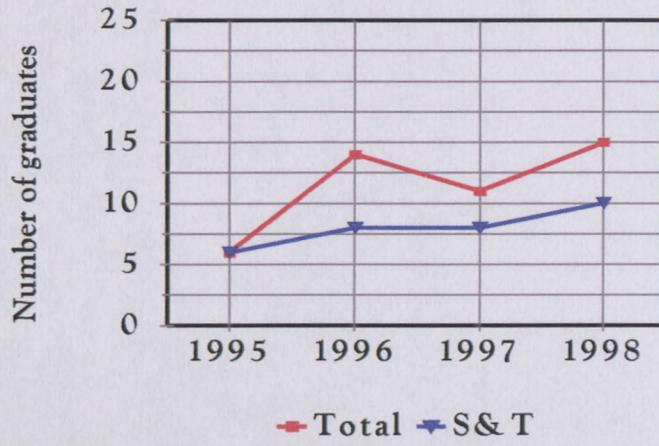


Figure 3.10. Total and S&T postgraduate output from technikons in the Eastern Cape.

establishment of a DOR office, administrative changes such as the formation of new committees, and greater emphasis on research by management as important changes that had occurred within the last five years or less. Technikon research administrators also cited greater emphasis on research, more resources for research, more direction from management and the emergence of a research culture on their campuses as indicative of a new approach to research. What has changed? Why do these institutions now consider it necessary to “tighten up” on research management and move away from a diffuse, decentralized system to something more akin to management of a business operation? Perhaps the answer is that research has indeed become a business operation that requires appropriate management.

Factors that would drive this include increased competition for funds and greater demands for efficiency and productivity, leading to a more corporatist approach to management in general. The close historic relationship between technikons and the private sector has resulted in these institutions adopting a businesslike approach to management, while declining government subsidies in the university sector, and the trend towards greater collaboration with the business sector, have put pressure on those institutions to manage their affairs more tightly than before. All of this leads to a vision of research (and research capacity) as a commodity which is managed like any other aspect of institutional activity.

While declining budgets may have stimulated a more businesslike approach

to research management, it has also had an unfortunate side effect which is manifest in the use (or misuse) by universities of the block grant for research included in DoE subsidies. The fact that two administrators were unaware of its existence is a matter for concern. While it is true that HWU's use internal funds to a greater extent for research than HBU's, in absolute terms these amounts still fall far short of the 15% block grant. Evidence from elsewhere in the country suggests that this situation is not confined to the Eastern Cape (NRF, 1999).

Technikons, of course, do not receive the block research grant yet internal funding for research has generally risen over the last five years in this sector compared to universities where funding from this source has, with one exception, declined drastically. Research budget cuts have been most severe in the HBU sector, probably because the research culture is less developed in these institutions and budgets are therefore vulnerable in times of financial difficulty. One respondent said:

"There is no clear policy on funding research at my university. I submit an annual budget to the Registrar of Finance and then wait to be told what if anything has been voted for research. In the last two years there has been virtually no internal funding for research."

It may not be surprising that much of the research at technikons is applied while at universities a greater proportion is of a basic nature. It is, however, interesting to note that the majority of universities indicated that their research had shifted towards strategic and applied projects over the last five years. This shift was ascribed to changes in government policy, which calls for more relevant, problem-oriented

research (DACST, 1996; DoE, 1997), and in the policies of funding agencies. It is also undoubtedly true that other funding opportunities, such as the Technology and Human Resources for Industry Programme (THRIP), the Innovation Fund and a host of international funding organizations, all with an emphasis on products and processes or problem-solving, would encourage applied research.

It is perhaps surprising that, given their close contact with industry, technikons nevertheless appear to conduct relatively little multidisciplinary research (15%) compared with universities (49%). Similarly, although overall there was relatively little inter-institutional collaborative research, universities were more active in this respect than technikons. The latter were also much more active in terms of multi-national research than the former. Notwithstanding their industry linkage, technikons in the Eastern Cape appear in general to be more isolated than universities, although they do report a trend towards greater institutional and international connectivity.

Differences in research output of technikons and universities found in the survey come as no surprise considering the history of these institutions, neither do the differences in this respect (and in terms of NRF-rated scientists) between HWU's and HBU's. What is of interest, however, is the apparent improvement in output of S&T graduates from HBU's. "Traditionally" HBU's were characterized by the preponderance of arts and education students which arose through political

constraints on the training these institutions could offer (Subotzky, 1997). Compared with their “white” counterparts, they were arts colleges where science and technology were poorly supported.

If one looks at the output profile of the HBU’s in the Eastern Cape today, however, they more closely resemble their HWU counterparts in that S&T output (Honours and Masters) make up similar proportions of the total in each case (26% for HBU’s and 36% for HWU’s). Only at Doctoral level is the original discrepancy still evident. When this is examined more closely, however, it becomes clear that the “improvement” is marginal in absolute terms and results from the demise of education as a preferred subject. While a discussion of this phenomenon is beyond the scope of this study, it is important to keep it in mind when assessing the apparent change in output profile of the HBU’s.

Notwithstanding a desire on the part of government to move towards a unitary system of higher education, there appears to be little formal convergence between technikons and universities. Despite their degree-awarding status, technikons still conduct research within a context of application and vocation, and have indicated in their 1999 prospectuses that they will continue to do so. Universities are, of course, forging greater links with the private sector, but they also realize that they have an obligation to protect and nurture less “market-oriented” subjects as part of the academic enterprise. It is this that will tend to maintain the

binary nature of higher education.

It is clear that changes in research policy and management have occurred at HEI's in the Eastern Cape over the last five years. This has been accompanied by a shift towards more applied and strategic research, involving more disciplines and institutions both nationally and internationally. The funding base at universities has also broadened as institutional budgets have declined. Serious disparities still exist between HBU's and HWU's although there is some evidence of positive trends in output in the former. The extent to which the changes and trends discussed above result from government initiatives, or arise from international imperatives, will be discussed in a subsequent chapter, following an analysis of the views of individual researchers.



Chapter 4

Perceptions of change in knowledge production and its Management among Researchers

4.1 Introduction.

Chapters 2 and 3 explored the nature of knowledge production at higher education institutions in the Eastern Cape from the viewpoint of research administrators. The information provides a perspective on how these institutions are structured and on some of the changes in management of research that they have seen fit to make, or perhaps have been forced to make, in the face of national and international trends in knowledge production. All of these institutions regard research as an integral part of their activities and some have a clearly articulated policy in this respect. These policies and statements of intent are, however, written in general terms and make reference to the need for competitiveness, relevance and excellence. They are, understandably, couched in institutional terms and address the issue of how the institution relates to other players (funders, competitors and clients) in the research landscape.

While individual researchers may share the overall vision of the institution where they work, it does not necessarily follow that they will have the same perception of the research landscape and its dynamics as their institutional

management. Apart from anything else, researchers are still rooted in their disciplines and may see developments in research in that context rather than as an overall enterprise. Such differences in perspective may lead to tensions within institutions when it comes to strategic planning, or when choices have to be made regarding which research areas should be developed, as institutions become more selective in the deployment of their resources. This Chapter will attempt to probe these issues as it looks at research from the viewpoint of the research practitioners themselves.

4.2 Institutional research policy.

When asked whether their institution had a clear research policy the majority of researchers (from a total 40) responded in the affirmative (Table 4.1). At the same time, a significant proportion (28%) thought that there was no policy.

One researcher said, "I have never been told about a research policy, or any other policy for that matter."

Said another, "If you want research funds you apply to the research committee but I don't know how they decide who gets what."

Furthermore, researchers at historically disadvantaged institutions were more likely to be of the opinion that their institution did not have a research policy than their colleagues on historically advantaged campuses (Chi square $p < 0.0001$; $n = 25$). A

Table 4.1 Responses by researchers to questions relating to the nature of their institution's research policy. Data are number of responses.

Category of affirmative response	Technikons (n=15)	Universities (n=25)
Have a research policy	10	18
Encourage research	13	19
Actions to support research	3	4
Priority for research	0	0
Changes in research policy/management		
Establishment of DOR	8	2
Administrative changes	1	2
Additional resources for research	4	8
Greater emphasis on research	2	3
More direction from management	0	4
Development of a research culture	2	1
Reasons for changes		
Institutional policy	5	8
Government policy	5	5
External factors (see text)	9	3
Other factors (see text)	2	7

majority also stated that their institutions encouraged research. Very few were of the opinion that their institution did anything concrete to effect their research policy beyond rhetoric, and none thought that research was considered a priority by their

institution.

Comments from researchers include,

"They say they encourage us to do research but you have to do it on your own."

"You have to beg for resources such as equipment and running costs."

There was no difference between technikons and universities (Chi square, $p < 0.836$), where the same pattern of responses emerged. Interestingly, there was also no difference in response between HDI's and HAI's (Chi square, $p < 0.744$) although at HWU's a significantly larger proportion of respondents indicated that their institution encouraged research, than was the case at HBU's (Chi square, $p < 0.039$).

Half of the 40 researchers interviewed felt that there had been no change in their institution's research policy over the last five years, while slightly fewer (17) felt that there had been changes. These fell into the same categories as those identified by administrators. Between 65 and 90% of respondents, it must be said, had no opinion on the type of change that may have occurred or reasons for any changes. Table 4.1 therefore presents the responses of those who identified changes. The majority of researchers in this group indicated that the most significant changes had been in the appointment of a Dean of Research and in providing more resources for research. More respondents from technikons cited the appointment of a Dean of Research as an important change than did those from universities. Conversely, respondents from universities were more likely to cite increased resources as an

important change. Some respondents from universities identified greater direction of research by management, but this was not mentioned by technikon researchers.

Table 4.1 also presents a breakdown of reasons given by this group for the above changes. Again they fell into the same categories as those identified by administrators. Among those who identified changes in the way research was managed in their institution, most cited changes in policy and greater responsiveness to community needs or, in the case of technikons, the requirements for awarding degrees, as the major reasons for change. University researchers also mentioned other developments, such as the establishment of Centres of Excellence, which had caused changes in the way research was done. Changes in government policy ranked relatively low in comparison to other reasons, particularly at the historically advantaged technikons. At historically disadvantaged technikons half of the researchers listed change in government policy as an important factor. Similarly, the only difference between HBU's and HWU's was that researchers at the former were twice as likely to cite changes in government policy as a driver of change in research as those at the latter.

Regarding the familiarity of researchers with the contents of the White Papers on Science and Technology and on Higher Education Transformation, researchers overall rated only 2.1 out of 5 for their knowledge of the former and slightly better (2.95) for the latter (Fig 4.1a). There was no difference between techikons and

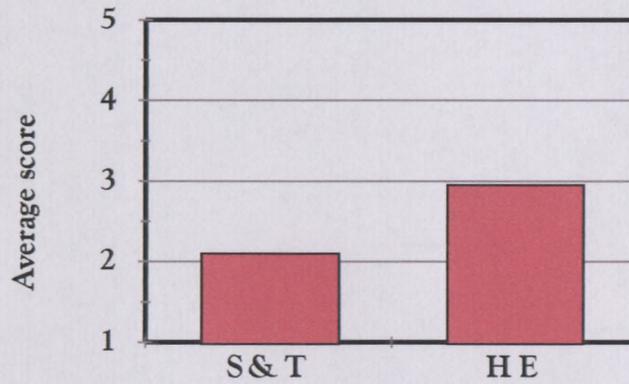


Figure 4.1a. Overall average scores by researchers for their knowledge of the White Papers on Science and Technology (S&T) and on Higher Education Transformation (HE).

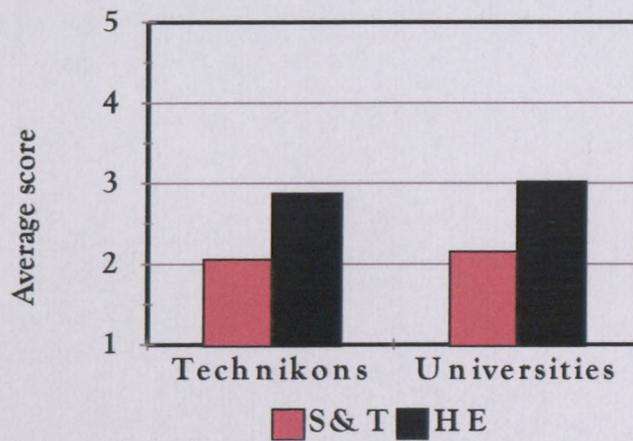


Figure 4.1b. Overall average scores by technikon and university researchers for their knowledge of the White Papers on Science and Technology (S&T) and on Higher Education Transformation (HE).

universities regarding knowledge of these documents (2.05/2.15 and 2.87/3.02 respectively) (Fig. 4.1b), but researchers at historically disadvantaged technikons and universities claimed a much better knowledge of the Higher Education White Paper than their counterparts at historically advantaged institutions (3.05/2.7 at technikons and 4.05/2 at universities).

4.3 Nature of research and research outputs.

Based on responses from researchers, current research in Eastern Cape technikons can be categorised as 58% applied, 36% strategic and 6% basic, while that at universities is 24% applied, 26% strategic and 50% basic (Figs. 4.2a and c). According to researchers the picture was somewhat different five years ago when technikon research was 38% applied, 48% strategic and 14% basic, and university research was 20% applied, 26% strategic and 54% basic (Figs. 4.2 b and d). In both cases there has been a slight shift away from basic towards applied research.

Further analysis indicates that there are differences in the nature of current research between historically advantaged and disadvantaged technikons in the province. At PE Technikon 51% of the research is considered strategic, 31% applied and only 18% is basic. Five years ago the situation was similar with 50% strategic, 43% basic and 7% applied (Figs 4.3 a and b). Researchers at historically disadvantaged technikons do not consider themselves to have done, or be doing, basic research at all. In this case current research is divided into 65% applied and

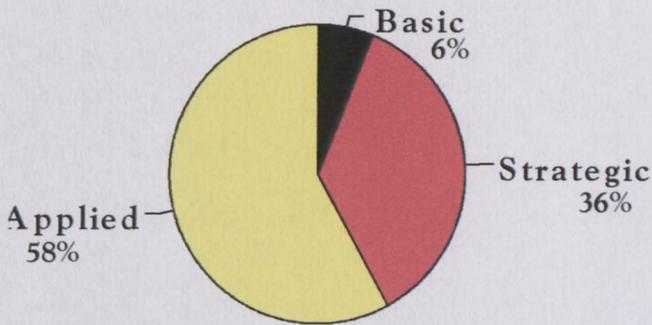


Figure 4.2a. Breakdown of current research by category at technikons in the Eastern Cape.

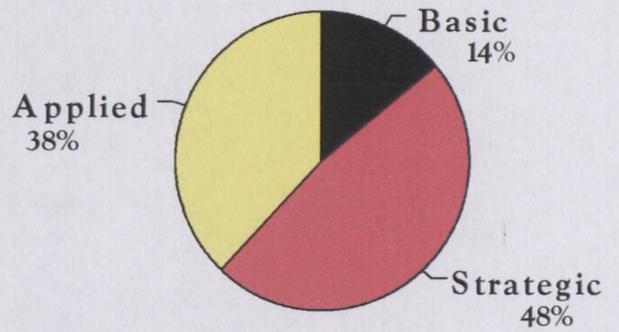


Figure 4.2b. Historical breakdown of research by category at technikons in the Eastern Cape.



Figure 4.2c. Breakdown of current research by category at universities in the Eastern Cape.



Figure 4.2d. Historical breakdown of research by category at universities in the Eastern Cape.

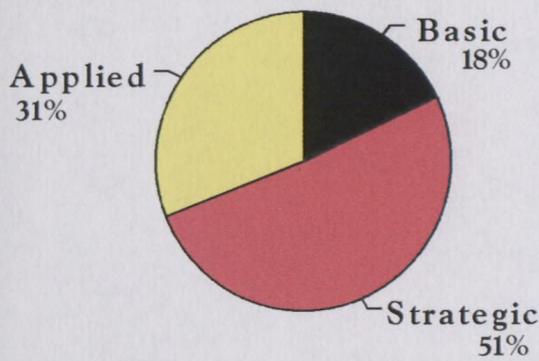


Figure 4.3a. Breakdown of current research by category at the Eastern Cape Technikon.

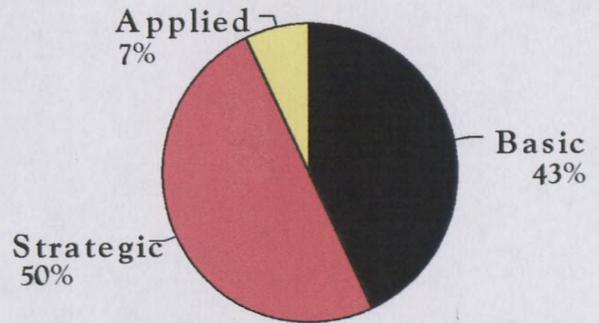


Figure 4.3b. Historical breakdown of research by category at the Eastern Cape Technikon.

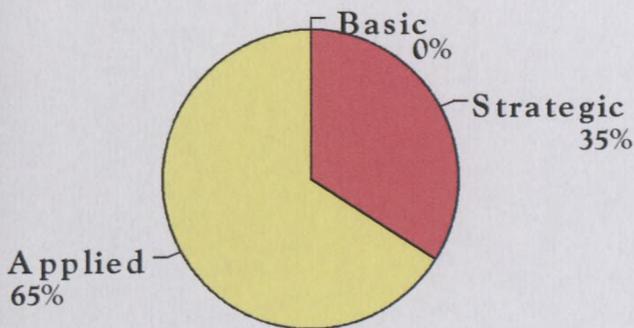


Figure 4.3c. Breakdown of current research by category at historically black technikons in the Eastern Cape.

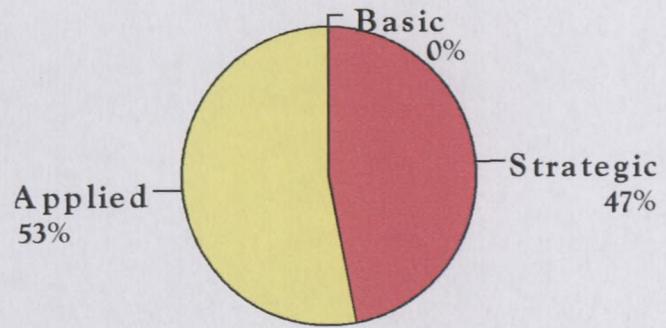


Figure 4.3d. Historical breakdown of research by category at historically black technikons in the Eastern Cape.

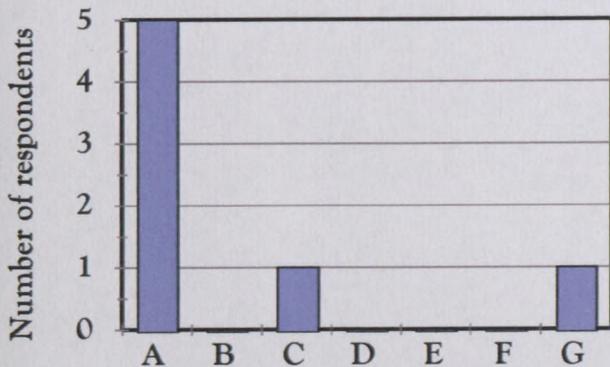


Figure 4.3e. Reasons given by respondents at the Eastern Cape Technikon for changes in the nature of their research. (Key on page 4.6)

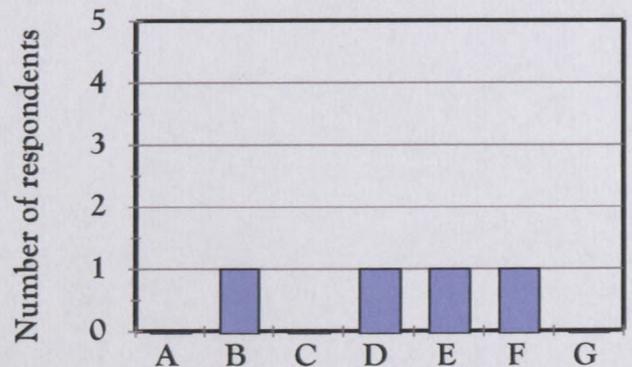


Figure 4.3f. Reasons given by respondents at historically black technikons in the Eastern Cape for changes in the nature of their research. (Key on page 4.6)

35% strategic, while five years ago the breakdown was 53% applied and 47% strategic (Figs. 4.3 c and d).

The reasons given by researchers for these changes fell into seven categories as indicated in the box below, which serves as the Key for Figures 4.3 e and f and Figures 4.4 e and f.

- | |
|---|
| A: Changes in institutional policy |
| B: Changes in government policy |
| C: Requirements of funding agencies |
| D: Recently joined the institution |
| E: Little time for research |
| F: Available funds |
| G: Applied nature of post graduate training |

It is interesting that among technicians, the reasons given by researchers at the historically advantaged institutions did not overlap with those given by researchers at historically disadvantaged institutions. In the former, most respondents said that changes in their institution's research policy had prompted them to change the nature of their research. Other reasons given were the requirements of funding agencies and demands created by the recent degree awarding status of the institution. Other reasons for changes in research were changes in government policy, availability of funds and, surprisingly, less time for research. This was explained by some in terms of the fact that applied work consisted of relatively short, problem-oriented projects which could be completed within a fairly short time, as opposed to basic research

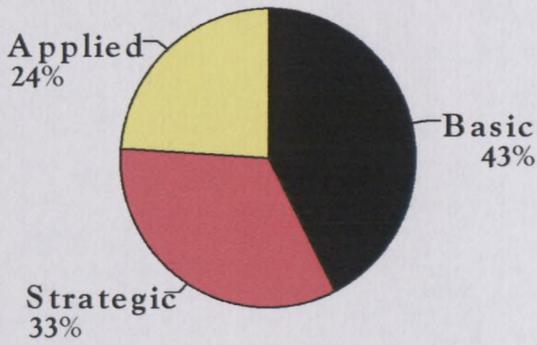


Figure 4.4a. Breakdown of current research by category at historically white universities in the Eastern Cape.

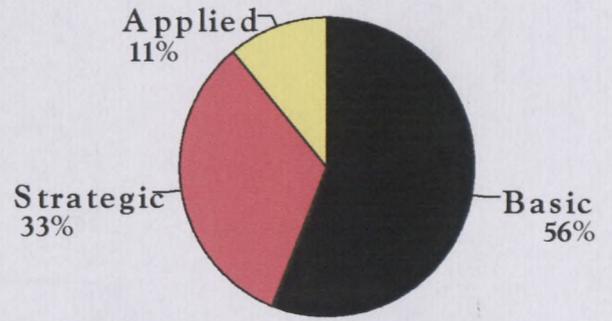


Figure 4.4b. Historical breakdown of research by category at historically white universities in the Eastern Cape.



Figure 4.4c. Breakdown of current research by category at historically black universities in the Eastern Cape.

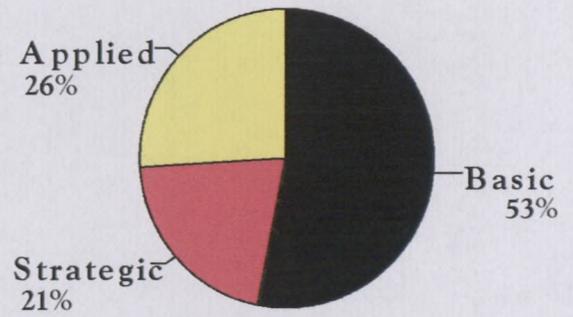


Figure 4.4d. Historical breakdown of research by category at historically black universities in the Eastern Cape.

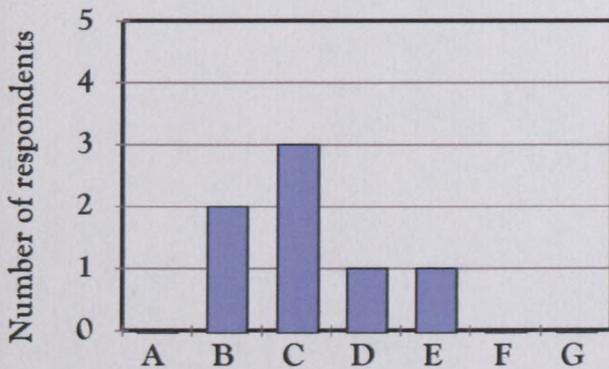


Figure 4.4e. Reasons given by respondents at historically white universities in the Eastern Cape for changes in the nature of their research. (Key on page 4.6)

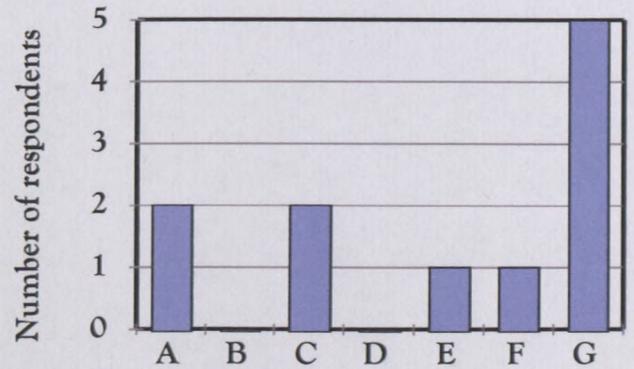


Figure 4.4f. Reasons given by respondents at historically black universities in the Eastern Cape for changes in the nature of their research. (Key on page 4.6)

which tended to be open-ended and for which funding was now more difficult to obtain. Furthermore, short projects also fitted in more easily with the heavy teaching commitments that technikon staff have.

At historically advantaged universities there is some evidence that applied research has become more common in recent years. Currently research at HWU's is divided into 43% basic, 33% strategic and 24% applied, while five years ago it was 56% basic, 33% strategic and 11% applied (Figs. 4.4 a and b). At historically disadvantaged universities, however, there has been little change in the nature of research over the last five years. Current research comprises 51% basic, 25% strategic and 24% applied, as opposed to 53% basic, 26% applied and 21% strategic five years ago (Figs. 4.4 c and d).

As with technikons, the categories of reasons given for changes in research tended to be different between HWU's and HBU's. The reasons given by respondents at HWU's included changes in government policy and requirements of funding agencies. Those given by respondents at HBU's included changes in institutional research policy, requirements of funding agencies and the fact that post graduate training tended to be more applied than before (Figs 4.4 e and f).

One researcher said, "There seems to be money only for applied research and students also want jobs so they are attracted to applied projects that give them experience for employment."

There is little evidence of change in the disciplinary nature of research conducted at technikons in the Eastern Cape. Currently 63% of research at PE Technikon is multidisciplinary as opposed to 58% five years ago, while at the other technikons the 67% of research is currently multidisciplinary compared with 72% five years ago (Table 4.2). Research at PE Technikon involving other academic institutions has increased from 31% five years ago to 45% currently, but the most dramatic change occurred at the historically disadvantaged technikons, where multi-institutional research increased from only 15% five years ago to 52% currently. Few researchers were able to give reasons for these changes but of those that did, changes in institutional policy and increased international contact were most often cited. There were no differences between technikons in this respect.

Multidisciplinary research at HWU's increased from 40% to 54% over the last five years, while at HBU's the increase was from 17% to 43% over this period (Table 4.2). Multi-institutional research at the former accounted for 23% five years ago compared to 43% today. At HBU's the change was from 24% to 56%. The majority of researchers who gave reasons for change said that personal preference for collaborative work was the reason, although increased industrial and international contact were also cited. Only one respondent cited changes in institutional or government policy as a reason.

Table 4.2 Breakdown of current research (%) at Technikons and Universities in the Eastern Cape.

Category	HWT	HBT	HWU	HBU
Multidisciplinary	63	67	54	43
Multi-institutional	45	52	43	56
Private sector partners	60	33	80	33
International partners	60	10	90	53

While 60% of researchers interviewed at PE Technikon were conducting research in collaboration with partners in the private sector, only a third of those interviewed at historically disadvantaged technikons were doing so (Table 4.2). However, researchers at the latter reported a greater increase in this activity than those at the former. The reasons given for the change were primarily changes in institutional policy and more opportunities for such collaboration.

The majority of researchers interviewed at HWU's (80%) said they were involved in research with the private sector, as opposed to 33% at HBU's. Over 80% of them reported that there had been an increase in this type of research over the last few years and ascribed the change mainly to increased opportunities for linkages. Other reasons included changes in institutional policy and increased exposure to the private sector, both here and abroad.

Only 30% of researchers interviewed at technikons said that they are currently

involved in international collaboration, although researchers at PE Technikon (HWT) were more likely to be involved in this way than those at other technikons. Half of these said that they were more involved in international research now than five years ago and cited changes in government policy, international exposure and the need to be competitive as reasons. There were no differences between historically advantaged and disadvantaged technikons in the suite of reasons given.

In contrast to technikons, the majority of researchers at universities (68% overall) said they were involved with international research. At HWU's 90% were so engaged compared with 53% at HBU's. The majority of researchers said they were more involved with international research than they were five years ago. The reasons given for the change were similar at both institutions, with the majority saying that there were now more opportunities for international collaboration and also more international exposure. One researcher explained this as follows, "When the country was isolated because of apartheid you couldn't do any collaborative work overseas. Now there are plenty of opportunities although the projects are complicated to set up and maintain because of bureaucracy."

Research outputs.

To gain an insight into average productivity among researchers in science and technology, respondents were asked to provide information on the number of various outputs they had produced over the last five years (1995-1999). These included the

number of Honours, Masters and Doctoral students who had graduated under their supervision, as well as the number of papers, conference presentations, books (including chapters) and patents they had produced in this period. Table 4.3 gives the average output of individual researchers at historically advantaged and disadvantaged technikons in the Eastern Cape.

Table 4.3 Average output (per 5 year period) of researchers at Technikons and Universities in the Eastern Cape (1995-1999).

Category	HWT (n=5)	HBT (n=10)	HWU (n=10)	HBU (n=15)
Honours graduates	0	0	11	4.2
Masters graduates	2.4	0	6	1
Doctorates	0	0	2	0.2
Co-supervision	2	0.1	0.7	0.4
Papers	2.4	.5	17	8
Conference papers	4.2	1.5	24	7
Books (or Chapters)	0.6	0.1	1	0
Patents	0	0	0	0

As would be expected, researchers at technikons supervise few post graduate students at present, which reflects their relatively recent entry into post graduate training. Nevertheless researchers at PE Technikon did supervise an average of two masters students during this time, while a small amount of co-supervision of masters

students was done at the other technikons. These researchers also produced a small number of papers and conference presentations. Surprisingly, considering their links with industry, none reported producing any patents over the last five years.

Table 4.3 also summarises the average outputs by individual researchers at historically advantaged and black universities. It is no surprise that universities produce substantially more post graduates than technikons considering that this has always been one of their chief activities. There is, however, a substantial difference in output between HWU's and HBU's. Researchers at the former supervised twice as many post graduates than their colleagues at HBU's.

One researcher explained this in the following way, "Black students generally do not go on to postgraduate studies because there is pressure on them to earn money once they have obtained a degree. Postgraduate study is seen as a luxury."

Researchers at universities also tended to be more involved with co-supervision of post graduates at other academic institutions than those at technikons but the numbers were still very small.

Although researchers at HWU's produce twice as many papers and three times the number of conference presentations as those at HBU's, there was no difference in production of books, book chapters or patents. Similarly, although researchers at universities produce more than ten times the number of papers and five times the number of conference presentations than their colleagues at technikons, there was

no difference between them in the production of books, book chapters or patents.

Institutional support for research.

The last part of the questionnaire probed further the issue of institutional support for research. When asked whether their institutions provided adequate support for research there were significant differences in response for the different types of institutions (Fig. 4.5a). In general researchers at historically advantaged institutions were more satisfied with the support given for research than their colleagues at historically disadvantaged institutions (Chi square, $p < 0.043$). This discrepancy was particularly striking within the university sector where over 80% of researchers at HBU's were dissatisfied with the support given them compared with 40% at HWU's.

Figures 4.5 b to d show the areas of inadequacy most often identified by researchers at the various institutions. Inadequate library facilities and insufficient research funds and time for research were the most common areas of dissatisfaction among researchers. Inadequate laboratories, equipment and computer facilities were more often identified by researchers at universities than at technikons.

4.4 Discussion.

Although this survey has shown that the majority of researchers interviewed

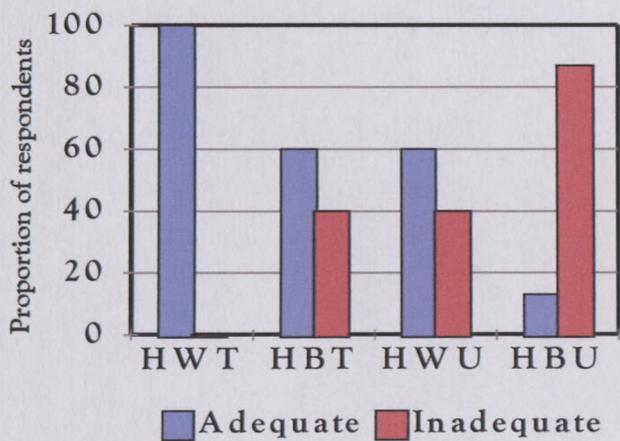


Figure 4.5a. Proportion of respondents who considered that their institutions provided adequate/inadequate support for research.

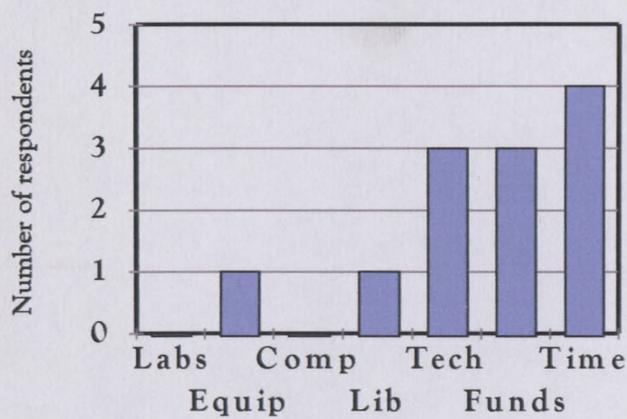


Figure 4.5b. Areas of inadequate support identified by researchers at historically black technikons in the Eastern Cape.

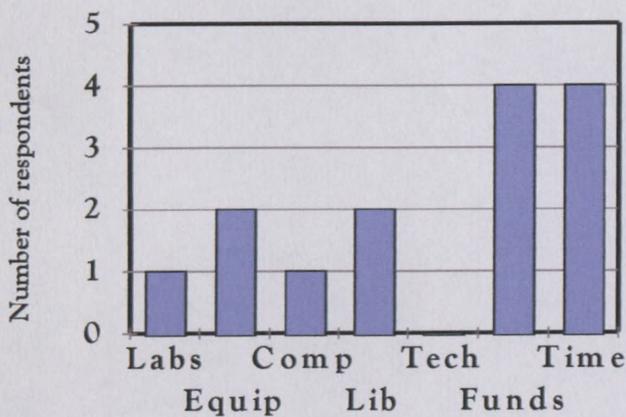


Figure 4.5c. Areas of inadequate support identified by researchers at historically white universities in the Eastern Cape.

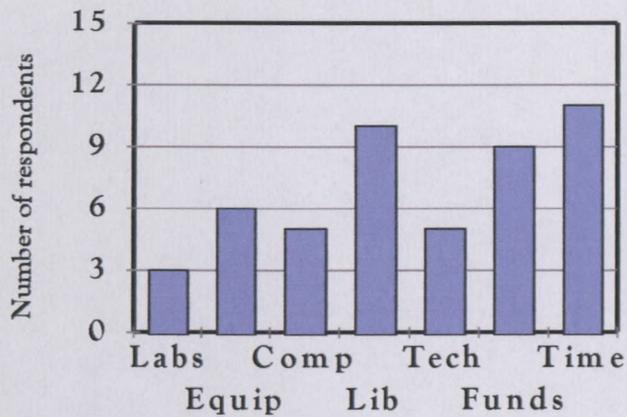


Figure 4.5d. Areas of inadequate support identified by researchers at historically black universities in the Eastern Cape.

were aware of their institution's research policy, it is clear that the degree of awareness varies between institutions on the basis of their historical position as advantaged or disadvantaged. Since only one HDI has no research policy, it appears that researchers on these campuses are simply unaware of their institution's policy in this regard. This disturbing situation could be due to the rather fluid state of research management on many of these campuses (see Chapter 2) where communication of management policy may be inadequate.

Equally disturbing is the very small number of researchers (17%) who thought that their institutions did anything to give substance to their encouragement of research. Irrespective of the type of institution (technikon/university; HDI/HAI), the majority either could think of no concrete action taken by their institution to promote research, or were categorical in saying that no such action had been taken. It is interesting that five of the eight administrators interviewed also felt that their institution did not support its research policy with actions. These findings indicate that there are discontinuities in the communication of philosophy and policy between senior management, research management and researchers on HDI campuses that are not evident at other institutions.

The above may also go some way in providing an explanation for the fact that less than half of those interviewed could identify any changes to their institution's research policy, or to the way in which research was managed. Although there were

no differences between universities and technikons in this regard, the fact that researchers at HBU's were more likely to cite changes in government policy as a driver of change in research may be indicative of their greater reliance on government funding.

Judging by their knowledge of the White Papers on Science and Technology and on Higher Education Transformation, researchers displayed a disturbing ignorance of the contents of these key policy documents. This may reflect a degree of insularity among science and technology practitioners who may be focussed primarily on their research. Whatever the case, the finding raises questions about the degree of informed debate on issues affecting post graduate training and research in general. What is perhaps more a cause of concern is the fact that in general administrators had only slightly better knowledge of these documents than researchers.

It is to be expected that applied research features prominently at technikons. The vocational training that these institutions traditionally offered and their close links with industry would predispose them to problem-solving research. Even here though, researchers indicated a move away from basic research in the last few years. This was, however, entirely due to a substantial shift towards applied research at PE Technikon. It is interesting that basic research has never featured at historically disadvantaged technikons. This may reflect either a more limited view of their

mandate as a vocational training institution or a lack of research capacity.

It is interesting that different suites of reasons for change were given by researchers at the historically advantaged technikon compared with those at the other technikons. In this case it is clear that changes in institutional policy have had a significant influence on the type of research done. At the other technikons research is a relatively new activity and there was only a vague idea of the factors that might be driving change. It is interesting that there was an apparent decline in strategic research in favour of applied research at technikons. This could be due, for example, to confusion among respondents about the distinction between these two types of research, although this was explained to them, or to a greater influence by industry (through funding) where the emphasis is on finding solutions to pressing production problems.

There is no obvious change towards applied or strategic research at the expense of other types at universities where basic research still accounts for most of the work done. The historical position of universities as centres of knowledge production, both within and outside the context of application, probably accounts for this. The shift towards strategic and applied research was more obvious at HWU's than at HBU's. This may reflect a greater capacity to capitalise on opportunities for linkage with the private sector (see below). Reasons given for change by researchers at HWU's tended to centre on government policy and the requirements of funding

agencies. At HBU's the requirements of funding agencies was also mentioned by researchers, but other reasons tended to be focussed on institutional issues such as research policy (or lack of!) and time constraints. It seems that researchers at HBU's are less aware of wider issues or perhaps are preoccupied with trying to do research under difficult conditions.

Two of the hallmarks of Mode 2 knowledge production are multidisciplinary and organisational diversity (Gibbons, *et al* 1994), and this survey has shown that, to varying degrees, research at HEI's in the Eastern Cape has assumed something of these characteristics. With the exception of historically disadvantaged technikons, all the institutions exhibited a move towards multidisciplinary, with the most dramatic change occurring at HBU's. At the same time there was substantial shift across the board towards multi-institutional research. It is intriguing that so few respondents could give reasons for this fundamental change in the type of research they are doing. It seems that until the question was posed to them, they had not thought about the change that had occurred.

Researchers were rather more definitive when it came to research with the private sector and international partners. Most said they were more involved with this type of research than before, although hard data were unavailable. It seems that industrial and international exposure has increased substantially in the last few years. However, the discrepancy between HDI's and HAI's suggests that the latter are better

able to take advantage of these opportunities than the former, probably because of better developed infrastructure and administrative capacity.

When it comes to research outputs, the focus by technikons on vocational training and on a smaller range of research questions, coupled with the fact that, until recently, post graduate training was virtually nonexistent, certainly contributes to their relatively low productivity. At the same time it is important to remember that much of the research is in the form of solutions or improvements to industrial problems or processes, often not published in the primary literature. A comparison with universities may therefore be somewhat unfair. Discrepancies between technikons do however require closer scrutiny.

Unlike PE Technikon, with its relatively long history of technological research, the other technikons in the province are not only younger, but were established primarily as secretarial and business training institutions. Science and technology training came somewhat later and those faculties are therefore still in an early development stage. It would be expected that this age difference, and the fact that the PE Technikon is much larger than the other two, would account to a certain extent for the difference in output between these institutions.

The situation at universities is, of course, rather different to that at technikons. Universities by definition are concerned with a much wider range of academic subjects and are not primarily focussed on problem solving research. There

are also many more academic staff at universities and simply on this basis it would be expected that output would be higher than that of technikons. A comparison with technikons would therefore not be expected to yield many new insights. On the other hand, it may well be illuminating to explore the discrepancies within the university sector, particularly those between HWU's and HBU's.

This study has shown that the "level" of academic activity is higher at HWU's than at HBU's. Researchers at HWU's supervise more post graduate students, attend more conferences and publish more papers than their HBU colleagues. With the exception of Vista, Port Elizabeth, which is a very small and young university, neither size nor age can convincingly be invoked to account for this difference. The difference in age between the HWU's for example is almost as great as that between Unitra and Rhodes, while Fort Hare and Rhodes are virtually the same age. UPE is smaller in terms of academic staff than Rhodes, but the latter is in turn smaller than both Fort Hare and Unitra (see Chapter 2).

Clearly, an explanation for the differences in research output, and other areas of knowledge production, between HWU's and HBU's must be found in other factors. Subotzky (1997) identified a most important contributing factor, namely the way in which the HBU's were created, within an apartheid context, with limited mandates and relatively remote geographic locations. These institutions were intended to train teachers and middle-level civil servants for homeland bureaucracies.

Research was never intended to be a significant feature of their activities, particularly in science and technology. What we see today is a legacy of this system and it should be no surprise that distortions exist in the praxis of science and technology in this sector. Another contributing factor is that the qualification profiles of academic staff at HBU's tends to be biased towards junior degrees. Few staff have doctorates and by implication their research experience and experience of supervising post graduate students is limited. Add to this the geographic isolation of the rural HBU campuses in the Eastern Cape, which makes it difficult to attract and retain highly qualified academic and technical staff, not to mention post graduate students (Cooper, 1997), and it is not difficult to see why output is low.

There are, of course other reasons for the higher output of academics at HWU's. These institutions have better resources in terms of technical support, library and laboratory facilities. They also have a larger number of post graduate students who usually participate in and assist researchers with their work. These factors, together with the fact that many academics co-publish their students' work, increase productivity appreciably.

What may, on the surface of it, be surprising is that HBU managements have not done more to provide their staff with the support they need for research and post graduate training, given that historical legislative restrictions on their activities disappeared in the early 1990's. The explanation for this anomaly is that the same

historical factors that undermined academic activity on these campuses, also impacted negatively on their management capacity. The recent history of these institutions is characterised by inadequate, or even non-existent management, which in some cases has not been satisfactorily resolved. Add to this the unrest and general turmoil that has characterised these campuses in recent years and it is no wonder that critical decisions concerning the development of research and the deployment of resources were not taken. The data do, however, indicate that, despite such problems, change is happening.



Chapter 5

Synopsis and Conclusions

5.1 Perceptions of knowledge production: a synthesis of the views of administrators and researchers.

Research policy and administration.

As this survey has shown, HEI's in the Eastern Cape, and even those that have been involved with research for many years, have been slow to "formalise" this activity through clearly articulated policies and administrative structures. The establishment of research directorates of one form or another is a recent phenomenon not yet common to all institutions. Although five of the eight institutions said they had a research policy, a significant proportion of researchers interviewed (33% at technikons and 28% at universities) thought that their institution had no such policy.

When it came to the views of administrators and researchers about whether their institution considered research to be a priority and supported it in concrete ways, there was greater divergence between HDI's and HAI's. Researchers generally disagreed with administrators on these issues at Port Elizabeth Technikon and Rhodes University, where they felt that their institutions did not consider research to be a priority or that enough concrete support was given for research. In contrast,

there was almost total agreement between administrators and researchers on the other campuses where, with the exception of Vista, all opinions were negative. Administrators at HAI's were generally more positive about their institution's stance in respect of research than researchers, while everyone was equally negative at HDI's.

While the general air of dissatisfaction apparent in HDI's may be understandable in view of the problems that these institutions have had, and continue to have (Education Policy Unit, UWC, 1996; Subotzky, 1997), the fact that this is also prevalent at HAI's bears further scrutiny. At previously advantaged institutions facilities, such as laboratories, equipment and libraries were of a high quality and provided cutting edge support for researchers. Such facilities are expensive to maintain and it could be that, in the current financial climate, institutions are having difficulty in doing so. In addition, the massification of higher education and changing student demography places additional teaching burdens on academic staff. Researchers used to high quality support may be expected to react negatively to any compromise on quality and view the current situation with alarm. It is interesting to note that many listed insufficient time and funds for research, and deficiencies in equipment and library facilities, among inadequacies that they identified in their institutions.

Notwithstanding differences in viewpoint of administrators and researchers, institutional managements are clearly intent on assuming a more direct, steering, role

in research. There was general agreement between administrators and researchers about whether there had been changes in institutional policy. Administrators generally cited changes in institutional and government policy as reasons for this, but responsiveness to community needs was also given as a reason. It is interesting that one of the more obvious reasons, namely the need for greater efficiency and return on investments in research was not mentioned. Although many of the same reasons were given by researchers, it is important to note that only 28% of respondents had opinions about what may be causing change. Judging from this, and their relatively poor knowledge of government policy documents, the conclusion must be that most researchers have not engaged in debates about wider policy issues and may not be particularly interested.

On the issue of research funding, it became obvious from the interviews with directors of research that no institution appears to use more than a fraction of the DoE block grant for research purposes and some seem to be decidedly secretive about it, to the extent that their directors of research were unaware of its existence. It also became clear that most institutions, particularly universities, are utilizing funds from external sources to a greater extent than they did in the past. This trend was confirmed by researchers who reported that they have more linkages with the private sector than before.

Nature of research.

Although it is clear that much of the current research effort at technikons is directed towards applied work, there was a substantial discrepancy between administrators and researchers in their estimates of the proportion of different types of research undertaken. According to administrators over 80% of current research is applied, while the average estimate by researchers was a more modest 58%. While administrators thought that 12% of the work was strategic, researchers estimated this type to account for 36%. Both agreed, however, that only 5% or so could be considered as basic research. This discrepancy may be due to the way in which projects are described for funding and reporting purposes. Researchers said that they tend to emphasise the applied nature of their work because of funding requirements.

Another area of disagreement was in estimates of whether these proportions had changed in recent years. While administrators said no, researchers indicated that they were doing considerably more applied work, and less basic research than before. To be fair, the distinction between strategic and applied is only one of time scale and these discrepancies may not have a bearing on research planning in these institutions.

Administrators at universities also differed from researchers in their assessment of the proportions of different types of research currently underway. According to them 35% of current work is basic while researchers estimated this to be 50%. They did, however, agree on the proportions of applied and strategic

research, and on the fact that there had been a shift towards these types in recent years.

While administrators in general ascribed this change to changes in government policy and to changes in the policies of funding agencies, researchers were somewhat divided on the reasons for the change in the nature of research. At PE Technikon the majority said this was due to changes in institutional policy, while at the other technikons the reasons were to do with availability of funds and time for research. At HWU's researchers concurred with administrators in citing changes in government policy and requirements of funding agencies, while at HBU's the major reason was said to be that post graduate students were demanding a more applied training which demanded applied research projects.

According to technikon research directors, only 15% of their research could be considered as multidisciplinary or multi-institutional, and only 3% as multi-national. Technikon researchers, however, classified their research as 65% multidisciplinary, 45% multi-institutional and 30% multi-national. All agreed that there had been a shift towards all three types of research in recent years. Increasing international exposure and reduced funding for single discipline-based work were cited as reasons by administrators. Most researchers did not express an opinion on what could be causing the shift. The large discrepancy between administrators' estimates of research type and those of researchers is difficult to explain but, if

administrators and senior management are, for example, largely or solely responsible for strategic decisions, this could result in research plans that either ignore existing initiatives or try to reinvent the wheel.

Multidisciplinary research at universities, according to directors of research, accounts for 49% of current work, with multi-institutional research accounting for 31% and multi-national work for 22%. According to researchers at these institutions, the proportions are 54%, 43% and 56% respectively (overlap between categories accounts for the fact that they add up to more than 100%). Administrators at universities appear to be underestimating the degree of inter-institutional collaboration and multi-national research currently underway.

5.2 Factors influencing knowledge production.

National policies.

Chapter 1 explored some of the broad policy initiatives that could be expected to affect the way in which research is done in HEI's in this country. In essence these initiatives affect the structure of the science and technology system of the country, not only by restructuring the channels through which funds flow to the HES, but also by demanding a more corporatist approach on the part of funding agencies. In addition, the government has called for a change in the nature of research itself, by demanding relevance and application.

Government policies in respect of the higher education system also call for rationalization of the mandates of our HEI's under the banner of differentiation. While nothing concrete has happened yet, changes to the status of our universities and technikons are imminent and will have a profound effect on knowledge production. This, however, is still in the future, even if only just so, and the question is: To what extent have existing policy initiatives affected the way in which research is done at HEI's in the Eastern Cape?

There is no doubt that current research at technikons and universities in the Eastern Cape bears many of the hallmarks of Mode 2 knowledge production. There is a significant amount of multidisciplinary, multi-institutional and multi-national work going on. Furthermore much of it is applied or strategic in nature, even at universities. Although it is not possible to say directly from this survey, the close linkages with the private sector that has developed in recent years may also mean that research topics are chosen by interests outside traditional academia and, possibly, the quality of that research may increasingly be judged by extra-academic interests. Researchers and administrators alike have said that these Mode 2 characteristics have developed over the last few years. Can it, however, be said that this is the result of changes in government policy?

As a result of several confounding factors, there is no straightforward answer to this question. Many of the changes, such as the shift towards applied research,

started at about the same time, or even earlier, than the first White Papers were published, ie in the mid 1990's. It is obvious that, while the pace of change may have increased as a result of these publications, they could not in themselves have initiated the changes. Some institutions at least were either proactive and moved in anticipation of policy changes, or they were driven by factors external to the country.

Certainly there was much speculation about the nature of possible policy changes some years before any concrete documents were produced by the government. Even before the transition to democracy in 1994, there were several initiatives by political parties aimed at restructuring the science and technology and higher education systems. In 1990, for instance, the ANC established its Science and Technology Group, and elements of a new S&T system were adopted by the National Party Congress of May 1992 (Grobicki, 1994). At the same time international organisations, such as the Ford Foundation and the Canadian International Development Research Center, became active in the country and, in fact, the latter was a major influence in the review of the S&T system (IDRC, 1993; Marais, 2000).

In August 1995 the then FRD sponsored a one-day symposium on the theme "The role of university research in South Africa amidst uncertainties of transition". The symposium addressed a number of issues from the effects of isolation (Amuah, 1995) to access and massification, to developing a common university identity for South Africa (Lickindorf, 1995). At this meeting the major problems facing South

African universities were discussed along with “solutions” such as inderdisciplinary and inter-institutional collaboration, redress, capacity-development, nurturing and maintaining international links and alternative learning methods.

This symposium provided indicators of the approach that could be taken regarding the nature of university research. In his opening address Professor Njabulo Ndebele (1995) had this to say:

“... the tertiary education system must be deracialized so that we can quickly remove the racial factor from discussions and focus on the substantive issues of priorities, programme reviews, rationalization, competitiveness in the international arena, and cost-effectiveness.”

He went on to say:

“... research will address problems that exist on a mass scale: preventative health care; materials research to meet, among many other needs, a massive housing backlog; job-creation and small business entrepreneurship; developing low-cost but effective technology...; technology transfer.”

In addition to the above a number of publications and conferences on the nature of training and research in the HES gave indications of things to come (Cooper, 1992, 1993a,b, 1995; Fisher, 1993; Amuah, 1994; Clark and de Wet, 1995; Kraak and Watters, 1995; Muller, 1995; Scerri, 1995; van Rensburg, 1995; Subotzky, 1997). Anyone with their ear to the ground should have been able to identify trends and to develop anticipatory strategies. The “alert” institutions would have read the signs and positioned themselves accordingly.

The degree to which HEI's in this study anticipated these changes is difficult

to establish. From the responses of administrators it would seem that the HAI's, technikons and universities alike, did anticipate the future to some extent and initiated changes to their research policy (and other policies as well). The HDI's on the other hand did not, at institutional level, appear to be proactive in any obvious way. Researchers in the HEI's, irrespective of their advantaged or disadvantaged status, appear to have been more proactive than their administrations in their involvement in multidisciplinary, multi-institutional and applied research. This is perhaps not surprising since researchers are generally closer to the day-to-day praxis of research. It seems that they have taken advantage of increased exposure to the private sector and greater availability of funding for Mode 2 type research, possibly through various FRD/NRF programmes and initiatives such as THRIP.

There is thus evidence to suggest that HEI's were to some extent proactive and that they (or at least researchers within them) were influenced by secondary influences on the way in which research is conducted, mediated by the private sector and funding agencies, rather than directly by government policies.

International factors.

To what extent can the changes in the nature of research observed at HEI's in this study be ascribed to international trends in knowledge production? Multidisciplinary and multi-institutional research, with extensive involvement of the

private sector, have been a feature of international knowledge production for many years (Weingart, 1997). It seems unlikely, however, that HEI's in the Eastern Cape have significantly altered their policies as a result of such international trends. Until relatively recently they, like the rest of South Africa, were largely isolated from the outside world. In addition, they are simply too small and have not yet developed their international networking capacity to the extent of some of their larger cousins elsewhere in the country. This does not mean, however, that they are insensitive to international forces. For one thing, all of them report an increase in the proportion of international research in recent years.

As with domestic policies, there were indicators, in the mid 1990's, of how international trends may affect South Africa. There has been talk, for example, of a sub-regional S&T policy for Africa (Jugessur, 1995). The aim of such a policy would be :

"... to contribute, through cooperative activities, to creating a science and technology culture at all levels of society, and thus better application of science and technology for the socio-economic development and economic integration of the subregion..."

The increasing exposure of South Africa to the international scene has brought with it greater involvement by foreign countries and institutions in S&T and higher education (Blankley *et al.*, 1998). The 1990's saw an explosion of funding options for researchers wishing to participate in developmental research and other collaborative research efforts (eg. EU, SANPAD, SIDA, and USAID, programmes).

A number of institutions have become involved in such programmes and as a result the international nature of their research has developed. This is stimulating them to consider international issues in a more formal way. Recently, for example, the University of Port Elizabeth advertised for a Director for an International Affairs Office and in its latest strategic plan Unitra intends to establish a similar structure (Unitra, 2000).

International trends will also percolate through to HEI's in the form of private sector linkages aimed at the development of products and processes intended to be internationally competitive. While such linkages have primarily involved technikons, universities are also getting into the act, as this survey has shown.

There are similarities between the findings of this project and those of the survey of Western Cape HEI's undertaken by Kraak and Watters (1995). Both studies found evidence of Mode 2 type research. In their case this was more evident in technology related areas than in the humanities, and more prevalent in some fields, such as engineering, than in others. What is interesting, however, is that their study was done five years ago, long before the White Papers on S&T and HE were published. Again, it seems that institutions, or at least researchers within them, were conducting multidisciplinary work involving partners outside academia.

The present study also corroborates the findings of the National Research and Technology Audit (CIS, 1998) inasmuch as it indicates the same division of basic and

applied research, as well as multi-institutional research. The higher education sector devotes approximately 23% of its research effort to basic research. The present study did not distinguish between applied and developmental research which are combined. This may explain the apparent contradiction where the audit says that there had been no significant change in applied research but a growth in development work. This translates, in the present study, to an increase in applied research. The survey also concurs with the audit in identifying the declining emphasis on and funding for basic research. The audit indicates a decline from 75% in 1991 to 55% in 1995/96. Compared with the audit, which indicated that 27% of publications from the higher education sector were of an interdisciplinary nature in 1995/96, the present study shows that over a third (37%) of research in the Eastern Cape is interdisciplinary.

5.3 Conclusions.

The nature of research in higher education institutions in the Eastern Cape appears to have changed in recent years by becoming more applied and multidisciplinary while drawing on external funding to a greater extent. While some, primarily advantaged, institutions have been proactive in changing their policies to accommodate expected trends in knowledge production, in others the change seems to have been driven from “below” as researchers responded to new opportunities

arising from government policy initiatives and international exposure.

This bottom up approach appears to have two side effects. Firstly, there is a gap in some institutions between the perceptions of research policy of administrators and researchers. Secondly, the latter appear to be unaware of the breadth of initiatives in which their researchers are involved, particularly those involving other institutions both locally and abroad.

A number of institutions, particularly those that were advantaged in the previous disposition, have become more businesslike in their approach to research development and management. Most now have formal structures dealing with institutional research management and there are indications that this is expanding to include international liaison. Unfortunately, some HBU's still lack strategic commitment to research and their determination in this regard will soon be tested by the restructuring of higher education. They will have to take strategic decisions about their future role in research.

It became clear during the study that administrators and researchers consider research a fundamental and vital part of the academic enterprise that persists, even in very difficult circumstances. It is therefore somewhat alarming that the task team on size and shape of higher education has suggested a tiered structure in which a number of institutions will be cut out of the research loop as it were, in favour of a teaching only mode (CHE, 2000).

The CHE document states on page 38 that:

“Involvement in research therefore makes heavy demands on higher education institutions with respect to the qualifications and quality of staff, research infrastructure, the quality and availability of postgraduate students, the quantity and quality of research outputs etc. These requirements make it impossible for South Africa to sustain an adequately resourced extensive and high-level research capability and involvement at every higher education institution on an efficient and effective basis.”

While this sounds very sensible, our particular historic context may predispose us to construct a higher education system which is alarmingly similar to that of the past (Badat *et al.*, 1994), with many of the same institutions carrying out their limited mandates in their remote geographic locations, not, as in the past, for racially-motivated ideological reasons, but for reasons of efficiency. Academics are judged by their research and post graduate training. Excising research from the portfolios of many institutions may doom them to mediocrity, if not closure (Dye, 2000), as academic staff leave in search of the support they need for research.

It is important for these institutions to formulate research policies that are selective and that will build on existing strengths. No institution can or should attempt to do everything, but some research capacity must remain to support an academic environment where good scholarship, which must of course include teaching, can flourish (Clark, 1997).

None of the institutions in the Eastern Cape are static in terms of research development. Even in those institutions with no clear research policy or guidance

from management, researchers are doing what their colleagues everywhere are doing, forming linkages, obtaining funding, developing research programmes, and producing knowledge.



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Appendix: Questionnaires

Research Management and Knowledge Production: Eastern Cape Study. Administration Questionnaire

Institution: _____

A1 What is your institution's policy with regard to research?

A2 How familiar are you with the contents of the White Paper on Science and Technology?
1 unfamiliar 2 3 4 5 very familiar

A3 How familiar are you with the contents of the White Paper on Higher Education Transformation?
1 unfamiliar 2 3 4 5 very familiar

A4 How has your research policy changed in the last five years?

1. Changes

2. Reasons

A5 What structures exist for the *academic* administration of research at your institution?

1. URC

2. FAC's

3. Other _____

A6 What is the composition and function of the Research Committee and its sub-committees?

Chair

1. DOR

6. Comp Man

2. DVC/R

7. Others

Members

3. Fac Reps

4. Dir Fin

5. Chief Lib

A7 What procedures do you use for allocating research funds?

1. Quas

2. Allocate

A8 What procedures do you use for quality assessment?

A9 How is the size of the internal research budget determined?

A10 Is the budget divided *a priori* between Natural and Human Sciences? If so on what basis is this done?

A11 What happens to the subsidy that your institution receives for SAPSE publications?

A12 How does your institution utilize the 15% SAPSE research allocation?

A13 What is the size, composition and function of your *institutional* research administration?

A14 When was the position of Director/Dean of Research established/filled at your institution?

A15 What proportion of your research would you characterize as:

Basic	0	25	50	75	100%
Strategic	0	25	50	75	100%
Applied	0	25	50	75	100%

A16 How have these proportions changed in the last five years? Not at all__
To basic__ To strategic__ To applied__

A17 To what do you ascribe these changes?

1. Changes in University policy	4. Other
2. Changes in Government policy	
3. Changes in funding requirements	

A18 What proportion of your research would you characterize as:

Multi-disciplinary	0	25	50	75	100%
Multi-institutional	0	25	50	75	100%
Multi-national	0	25	50	75	100%

A19 How have these proportions changed in the last five years? Not at all__
 To multi-disciplinary__ To multi-institutional__ To multi-national__

A20 To what do you ascribe these changes?

1. Changes in University policy	4. Other
2. Changes in Government policy	
3. Changes in funding requirements	

A21 What is the total annual research budget of your institution?

A22 How has this budget changed in real terms over the last five years?

Decreased__ Constant__ Increased__

A23 To what do you ascribe this change?

A24 What proportion of the research budget comes from the following

Internal budget	0	25	50	75	100%
Funding Councils	0	25	50	75	100%
Industry/Business	0	25	50	75	100%
International sources	0	25	50	75	100%

A25 How have these proportions changed in the last five years? Not at all__
To internal__ To Funding Councils__ To industry__ To international__

A26 To what do you ascribe these changes?

A27 How many scientists do you have in the following NRF categories

A	B1	B2	C1	C2	C3
Y	L				

A28 What is your annual output of SAPSE publication units in the natural sciences?

A29 How has this output changed in the last five years? Not at all__
Decreased__ Constant__ Increased__

A30 To what do you ascribe this change?

**Research Management and Knowledge Production: Eastern Cape Study.
Academic Questionnaire**

Institution: _____

Department: _____

B1 What is your institution's policy with regard to research?

B2 How familiar are you with the contents of the White Paper on Science and Technology?

1 unfamiliar 2 3 4 5 very familiar

B3 How familiar are you with the contents of the White Paper on Higher Education Transformation?

1 unfamiliar 2 3 4 5 very familiar

B4 From your perspective how has your institution's research policy changed in the last five years?

1. Changes

2. Reasons

B5 How much of your current research would you describe as:

Basic	0	25	50	75	100%
Strategic	0	25	50	75	100%
Applied	0	25	50	75	100%

B6 How much of the research you did five years ago would you describe as:

Basic	0	25	50	75	100%
Strategic	0	25	50	75	100%
Applied	0	25	50	75	100%

B7 To what would you ascribe any change in emphasis?

- | | |
|---------------------------------|------------------------------------|
| 1. Personal preference | 4. Changes in funding requirements |
| 2. Changes in University policy | 5. Other |
| 3. Changes in Government policy | |

B8 How much of your current research would you describe as:

Single discipline-based	0	25	50	75	100%
Multidisciplinary	0	25	50	75	100%

B9 How much of your research of five years ago would you describe as:

Single discipline-based	0	25	50	75	100%
Multidisciplinary	0	25	50	75	100%

B10 To what would you ascribe this change ?

- | | |
|---------------------------------|------------------------------------|
| 1. Personal preference | 4. Changes in funding requirements |
| 2. Changes in University policy | 5. Other |
| 3. Changes in Government policy | |

B11 How much of your current research would you describe as:

Single institution-based	0	25	50	75	100%
Multi-institutional	0	25	50	75	100%

B12 How much of your research of five years ago would you describe as:

Single institution-based	0	25	50	75	100%
Multi-institutional	0	25	50	75	100%

B13 To what would you ascribe this change ?

- | | |
|---------------------------------|------------------------------------|
| 1. Personal preference | 4. Changes in funding requirements |
| 2. Changes in University policy | 5. Other |
| 3. Changes in Government policy | |

B14 Are you currently undertaking research involving international collaboration?

B15 How has the extent of your international collaboration changed in the last five years?

Decreased__ No change__ Increased__

B16 To what would you ascribe this change ?

- | | |
|---------------------------------|------------------------------------|
| 1. Personal preference | 4. Changes in funding requirements |
| 2. Changes in University policy | 5. Other |
| 3. Changes in Government policy | |

B17 Are you currently undertaking research involving industry/business collaboration?

B18 How has the extent of such collaboration changed in the last five years?

Decreased__ No change__ Increased__

B19 To what would you ascribe this change ?

- | | |
|---------------------------------|-------------------------------------|
| 1. Personal preference | 4. Changes in funding requirements |
| 2. Changes in University policy | 5. Changes in funding opportunities |
| 3. Changes in Government policy | 6. Other |

B20 How many post-graduate students are you currently supervising
within your institution?
at other institutions?

B21 Has the number of post-graduate students that you supervise Decreased__
Not changed__
Increased__ in the last five years?

B22 To what do you ascribe this change?

- | | |
|---------------------------------|-------------------------------------|
| 1. Personal preference | 4. Changes in funding requirements |
| 2. Changes in University policy | 5. Changes in funding opportunities |
| 3. Changes in Government policy | 6. Other |

B23 How many of the following have you produced in the last five years?

Papers (incl in press)

Conference presentations

Honours graduates

Masters graduates

Doctoral graduates

Patents

Books

B24 Would you say that your institution provides you with adequate support for your research?

B25 If you answered No to the previous question, list the areas you consider to be deficient.

1. Laboratories

8. Other

2. Equipment

3. Computer services

4. Library

5. Technical support

6. Funding

7. Time (high lecture loads)

