UNIVERSITY OF SOUTHAMPTON

FACULTY OF LAW, ARTS AND SOCIAL SCIENCES

SCHOOL OF MANAGEMENT

Factors influencing a productive research management environment at two merging higher education institutions in South Africa

Volume 1 of 2

by

Anita Venter

Thesis for the degree of Doctor of Philosophy

March 2006

Abstract

UNIVERSITY OF SOUTHAMPTON
ABSTRACT
FACULTY OF LAW, ARTS AND SOCIAL SCIENCES
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FACTORS INFLUENCING A PRODUCTIVE RESEARCH MANAGEMENT ENVIRONMENT AT TWO MERGING HIGHER EDUCATION INSTITUTIONS IN SOUTH AFRICA
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In this case study, employing mixed methodology, the topic of research management at two merging higher education (HE) institutions in South Africa was investigated. The overall goal of the study was to identify factors that influence a productive research management environment at the merging institutions in order to design a new research management system. In the quantitative phase of the study a theoretical model of factors that influence research output was tested and refined through the results of a survey administered to 948 academics. Furthermore, a factor analysis produced an empirical model, which also supported the qualitative findings. Both the theoretical and empirical models were tested for factors that predict research output. Based on the one-way analyses of variance, 'Age'; 'Years employed in HE'; 'Job seniority level'; 'Commitment'; 'Individual skills and competence'; and 'Professional activities' significantly predicted research output. A regression analysis of the theoretical model indicated that both 'Professional activities' (83.46%) and 'Individual skills and competence' (94.52%) have a high prediction rate of the dependent variable 'Research output'. Furthermore, 'Individual skills and competence' is relatively uncorrelated with 'Professional activities', which indicates that both independently predict research output. A logistic regression analysis indicated that for the empirical model the factor 'Tangible factors' predicts research output better for non-research-active academics (91.4%) than for the research-active academics (33.3%). Therefore, the research output of the active researchers is predicted by factors other than 'Tangible factors'.

In the qualitative phase of the study, twenty (20) unstructured interviews with senior managers were conducted and analysis utilizing Atlas.ti was done. Three factor networks (including factor relationships) were derived, namely, the 'tangible', the 'intangible' and 'tools for organizing people and resources' networks. Furthermore, the networks resulted in the development of a responsibility triangle applicable in the design of organizational structure and decision-making powers, and a typology of phases of institutional research development.

The findings of the research, although directly applicable to the two case institutions and the merged institution that has resulted, provide insights into the design of research management systems and institutional research development at higher education institutions. The study was concluded with recommendations for further research in order to generalize findings.

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Acknowledgements

I wish to acknowledge and thank the following people for the dedication, support and commitment I received throughout my studies:

- Theunis and Kira Venter, without you life is meaningless;
- Jan and Ann Bosch, you dignify my life experience;
- My family and friends, for encouragement and love;
- Professor John Taylor, for embarking on and finishing this higher education management journey with me;
- Professors Gert Roodt and Willem Schurink, for your guidance and insights into research;
- Statistical Consultation Services for their professional data analysis advice;
- The late Professor Barend Lessing, for creating this learning opportunity;
- My employer institution and colleagues who afforded me time and resources to conduct the research;
- Professor Craig MacKenzie who initially edited the text;
- Anneline Hammond for assistance with the document layout; and
- Teresa Kapp, for your friendship and endless editorial feedback.

With the oversight of my supervisor, editorial advice has been sought. No changes of intellectual content were made as a result of this advice.

Definitions and abbreviations

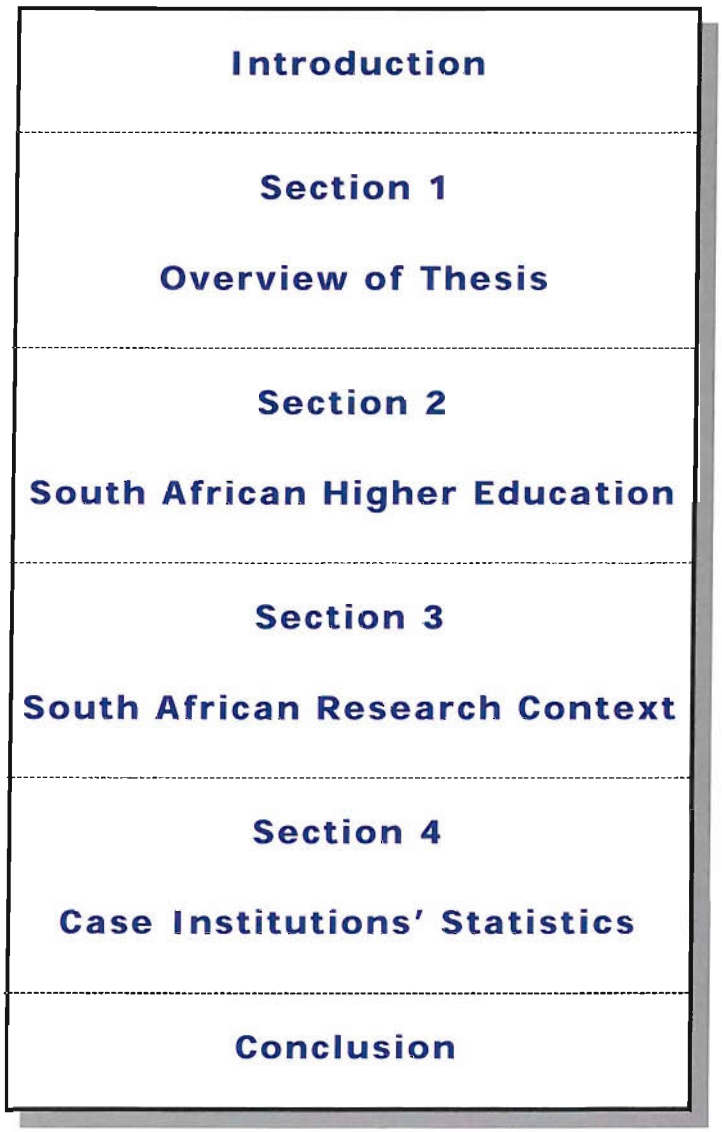
CHE	Council on Higher Education.
Comprehensive institution	Higher education institution where both university-type and technikon-type qualifications are offered.
DoE	National Department of Education
FET	Further Education and Training band.
GET	General Education and Training band.
HE	Higher education.
HEQC	Higher Education Quality Committee.
HET	Higher Education and Training band.
HSRC	Human Sciences Research Council.
Intangible factors	Factors that are difficult to quantify and are therefore not easy to measure; are difficult to imitate by competitors, are not tracked through accounting, and result in sustainable competitive advantage.
ISI	Institute for Scientific Information.
NACI	National Advisory Council on Innovation.
NCHE	National Commission on Higher Education.
NHEIAS	National Higher Education Information and Applications Service.
NQF	National Qualifications Framework.
NRF	National Research Foundation.
NSI	National System of Innovation.
NWG	National Working Group.
PQM	Programme Qualification Mix.
Publication productivity	For purposes of this thesis publication productivity is used as an indicator of research productivity and is measured as self-reported number of publications published over a three-year period.
Research environment	The total research system over which an institution has control.

S&T	Science and Technology.
SAPSE	South African Post Secondary Education. The DoE's research subsidy paid to higher education institutions based on officially recognized SAPSE research output produced by academics.
SAQA	South African Qualifications Authority.
Tangible factors	Factors usually associated with measurable targets, detailed plans, rigorous evaluation and decisive action – all of which are observable (perhaps programmable) behaviour, systems and facilities.
Technikon	Higher education institutional type similar to a polytechnic or a university of technology.

CHAPTER 1

The South African Higher Education Context

Layout of Chapter 1



Introduction

The purpose of this chapter is to explain the origins of the research project from which this thesis derives and to describe the context and relevant history and terminology specific to South African higher education (HE). The greater part of the chapter is written with the non-South African reader in mind. In order to achieve this purpose the chapter is divided into four main sections. Section one is devoted to explaining the origins of the thesis as a project and to stating the research purpose and questions together with the contribution that the thesis makes in theoretical, practical and methodological terms. The first section is concluded with an explanation of the chapter layout of the thesis.

The second section describes challenges facing global HE and the impact that these have on South African HE. It then goes on to provide a history of South Africa's HE system by explaining the recent history of the country and the influence of political ideology on higher education. This is followed by a description of the current restructuring of South African HE institutions and the section is concluded by explaining the meaning that is given to the term transformation.

The third section of the chapter describes the history of research in South Africa, homing in on recent developments in public higher education institutions. The research output of South African higher education institutions is presented and the section is concluded with a brief discussion of the research imperatives facing the country.

The final section of the chapter provides the basic statistics and facts of the two case institutions from which the research data derives. The purpose of this section is to provide the reader with some background on the case institutions.

Section 1

1.1 OVERVIEW OF THE THESIS

1.1.1 ORIGINS OF THE RESEARCH PROJECT

This PhD thesis is based on a project that was undertaken between August 2003 and March 2005, over a period of one year and eight months, in a pre-merger phase between two higher education institutions. I was keenly interested in investigating research management as a strategic imperative at a higher education institution. Once the merger between a university and a technikon was announced, it presented me with an opportunity to gain access to data to support my thesis and also to contribute in a practical manner to the debate about research management in the envisaged 'comprehensive university.' Accordingly, I offered to plan and execute an investigation into the two institutions' research management systems, and was solely responsible for collection and analysis of the empirical data to support both purposes. The thesis project formed part of the investigations and deliberations between the university's Research Management task team, of which I was a member, and the joint Merger Research Management task team between the two institutions, of which I was not a member, as well as the technikon's management team. In the search for a research management system for the new institution I constantly had to communicate with the senior management at both institutions concerning my results and findings. These were included in discussions where I was present but also served as discussion documents at other forums where the topic of research management was deliberated.

1.1.2 RESEARCH PROBLEM

> *"...there is little evidence of a substantial shift in the ways South African universities and their counterparts produce knowledge..."*
>
> (Jansen, 2002, p. 507)

Although some universities in South Africa have started moving towards formal research management, the professional management of research at South African universities is in its infancy. Benneh (2002, p. 249) states that policy-makers in Africa have regarded research at universities as an

> *"...esoteric enterprise whose real value in terms of addressing the critical and urgent problems that confront society is not easily recognizable and appreciated."*

Therefore, research management is developing very slowly in most African universities. For purposes of this study, research management is defined as the professional management (Neave, 2002, p. 218) of activities related to the research function of a higher education institution. Research-related activities include:

- Research policy formulation (Benneh, 2002, p. 253);
- Research strategy formulation (ACU, 2003, p. 6);
- The development of academic researchers (Braddock & Neave, 2002, p. 318; ACU, 2003, p. 4);
- Marketing of research services and products (Braddock *et al.*, 2002, p. 318, ACU, 2003, p. 4);
- Bidding for and administering of research funding (Braddock *et al.*, 2002, p. 318; ACU, 2003, p. 4);
- Preparation of applications for agencies (Braddock *et al.*, 2002, p. 318);
- Donations and fundraising (ACU, 2003 p. 4);
- Ethical clearance (ACU, 2003, p. 4);
- Commercialization and dissemination of research (ACU, 2003, p. 4);
- Intellectual property (ACU, 2003, p. 4); and
- Management of grants and contracts (ACU, 2003, p. 4).

South African universities are still largely managed by the collegiate, and day-to-day management activities are executed by administrators who have to report back to the collegiate. There is little concerted effort to direct the research efforts of institutions and thereby ensure research excellence through formal institutional research management.

Conversely, very little research has been conducted into institutional research management in South African higher education. Complementary studies that have been conducted focus on a study leader's skills in relation to postgraduate student progress (Schepers & Blignaut, 1994; Strydom, 2001; Schepers, 2001). Several other

variables in the relationship between research supervisors and their students have been investigated in numerous studies at South African universities (studies cited in Strydom, 2001, p. 14). During 1990 an investigation into the management of quality in postgraduate training in South Africa was conducted (Sellschop, 2001). Although these studies are helpful in understanding the student-to-study-leader relationship as well as factors that influence the quality of postgraduate research, I would suggest that this is merely one level of the management of research at a higher education institution. I believe that research management occurs at various levels within a higher education institution, and the supervisor–student relationship is located at the micro level.

Furthermore, research-related activities, as listed on the previous page, are usually associated with measurable targets, detailed plans, rigorous evaluation and decisive action – all of which are observable (perhaps programmable) behaviour also referred to as tangible factors. These tangible and technical factors of research management include organizational structures for research management, and types of research offices (ACU, 2003, p. 1) as well as categories of research funding (Bushaway, 2003, p. 20). Becker, Huselid and Ulrich (2001, p. 13) argue that the tangible factors of any successful organization can be copied, technology can be bought, and in theory you should have an instantly thriving organization – not unlike cloning. It is, however, clear that although many organizations have exactly the same technology and structure as their successful competitors, they still fail to succeed. This raises the proposition that the intangible factors of an organization are what create success or failure. Intangibles are difficult to quantify, are based on people's assumptions, cannot be bought or imitated, and appreciate in value with purposeful use (Becker et al., 2001, p. 15). Intangibles, such as people management and the management of relationships such as power relations and participation, become part of the competitive advantage of an institution. In the ruling pragmatic paradigm of current management practice, managers assume that 'if you can't measure it, you can't manage it' (Galbreath, 2002, p. 116) and therefore managers tend not to focus their attention on intangible factors, predominantly as a result of the manner in which their own performance is evaluated. Another reason for the lack of focus on intangibles is that they are not articulated and therefore cannot be measured.

A large percentage of the knowledge capital of the global economy is managed and retained in a university setting through the management of tangibles and intangibles. I propose that tangibles are seldom what create a thriving research university and that intangibles are the factors that create competitive advantage. I further propose that, for research management, intangible factors do not exist without tangible factors. A university cannot manage its research function on intangible factors alone – although many universities attempt to function solely on tangible factors. Research management can only be optimized through a balanced combination of tangibles and intangibles. In order to identify the tangible and intangible factors, the following statement of Teodorescu (2000, p. 202) is especially important:

> *"Little is known about the variety of factors influencing faculty publication productivity in different nations, and especially those from the developing world."*

In this regard an investigation of the factors that influence a productive research management environment at two merging South African higher education institutions, and an investigation that probes the levels at which research management occurs within these institutions, is proposed. An overview of the literature indicates that there are various factors, or variables, that play a determining role in high research output. These factors have, however, not been classified as tangible or intangible and a full set of factors has not been identified at the institutional management level.

1.1.3 RESEARCH QUESTIONS

The main research questions are:

1. What are the factors that influence a productive research management environment at two merging higher education institutions?
2. What are the tangible as well as intangible factors that influence the delivery of research at two merging higher education institutions?

The secondary research questions are:

a. What are the systemic interactions between the tangible and intangible factors?
b. Are there different purposes for the research management function and, if so, what are the dynamics between these purposes?
c. Do these factors correspond with any particular organizational levels in an organigram?
d. Which factors are predictors of research output?
e. Do certain factors vary according to different disciplines or between different staff groupings (e.g. by age, or gender)?

1.1.4 DEMARCATION OF RESEARCH BOUNDARIES

This study looks at two merging South African institutions with very different traditions of research and research management. One institution is a university and the other a technikon (university of technology). While the conclusions are not necessarily generalizable beyond this particular study, it is believed that new understandings of the factors that influence the delivery of research in a modern university setting will emerge that will be of wider relevance in the field of higher education management in developing nations.

1.1.5 CONTRIBUTION OF THE THESIS

Three forms of contribution – namely, theoretical, practical and methodological – are offered.

1.1.5.1 Theoretical contribution

This thesis will contribute to the overall pool of knowledge about research management at higher education institutions, and - more specifically - to perspectives on research management from a developing country context. The research is also grounded in the field of management and will contribute greatly to the knowledge about the management of academics (knowledge workers) and their relationship with university administrators in relation to research management. Furthermore, the study

will contribute to an expansion of knowledge regarding tangible and intangible factors in the context of research management at a university.

The theoretical objectives of the study include a theoretical exploration of:

- Research and knowledge production;
- Academic disciplines;
- Research management;
- Research productivity;
- Organizing and structuring of a university;
- Institutional research management practices;
- The relationship between teaching and research;
- Scholarship;
- The job components and working conditions of academic staff;
- Elements of individual skills and competence of academic and research staff;
- Professional activities of academic and research staff; and
- Definitions of tangible and intangible factors.

1.1.5.2 Practical contribution

The study will contribute to managers' understanding of their role and function at various levels in a university research management system. The thesis will also provide insight into the intangible factors that support tangible research management factors and will therefore aid research managers in identifying these factors in their institutions so that they may expand and improve their current research management systems.

Furthermore, tangible factors are vitally important to institutions that want to set up a new institutional research management system. The study will contribute greatly to South African higher education in the sense that, presently, many higher education institutions do not have a formal institutional research management system and specifically at the case institutions, where the research will impact directly on the formation of a research management system for the newly merged comprehensive university.

1.1.5.3 Methodological contribution

One of the main contributions that the research will make to the methodology is that it will employ both qualitative and quantitative research methods within a case study design. Furthermore, the use of the Atlas.ti qualitative data analysis programme will contribute to an understanding of the practical use of computer technology in the analysis of qualitative data.

1.1.6 CHAPTER LAYOUT

The thesis is structured as follows:

Chapter 2: In Chapter 2 a literature study covering the theoretical objectives of the study is undertaken.

Chapter 3: Chapter 3 describes the research methodology as well as the research design for the thesis. The research design contains a quantitative as well as a qualitative phase.

Chapter 4: In chapter 4 the results and findings of the quantitative phase are presented.

Chapter 5: This chapter presents the qualitative data.

Chapter 6: This is the final chapter of the thesis and contains an integrated discussion of the results of the quantitative results and qualitative data presentation, conclusions reached by the researcher, as well as indications of future research.

Section 2

1.2 SOUTH AFRICAN HIGHER EDUCATION

1.2.1 IMPACT OF GLOBAL HE CHALLENGES

There are large-scale forces driving change in South African higher education (HE), and these are in some ways unique to the country – as will be explained in detail in the next section of this chapter. South African higher education is subject to external pressures inherent in the global environment (Jansen, 2002, p. 507). Briefly some of these issues include borderless higher education in regional blocks such as the Southern African Development Community (SADC, 2001) and the European Union; the Internet and e-learning; a drive for public accountability resulting in managerialism (Uhr, 1990, p. 22); the marketization of higher education resulting in the popularizing of research and teaching; entrepreneurial universities (Clark, 1998); the widening of participation in higher education; and continuous and lifelong learning.

More specifically regarding research, the research function is no longer the sole domain of higher education. Although universities are the most ubiquitous of research organizations, there are many organizations and individuals who contribute to the production of knowledge. Organizations such as national research councils, specialized centres for innovation, non-governmental organizations, science parks and providers of research databases, and private companies, to name a few, contribute significantly to the pool of knowledge (Bushaway, 2003). In trying to stay ahead in the knowledge generation race, universities have no choice but to collaborate with other partners and cross disciplinary boundaries. These global phenomena frame the explanation of the history of the South African HE system, which is presented next.

1.2.2 HISTORY OF SOUTH AFRICA'S HE SYSTEM

> *"South Africa's higher education system has considerable capacity in research, teaching and physical and human resources. Yet the system is fundamentally flawed by inequities, imbalances and distortions deriving from its history and present structure"*
>
> (NCHE, Final Report, 1996, p. 1).

This statement forms the backdrop for the drive towards the transformation and reconstruction of South African higher education. In order to understand the challenges and changes in South African HE, some background on the history of the country is required.

1.2.2.1 History of a country

South Africa was inhabited by the Khoisan people in the Cape region and various black tribes toward the north of the country when it was first 'discovered' in 1488 by the Portuguese explorer Dias while circumnavigating the Cape of Good Hope en route to India (SA History Online, 2005). The white population of South Africa stemmed from the colonization of the Cape by the Dutch in 1652, which brought settlers from Western Europe and the settlement of a few hundred French Huguenots in 1688 (Giliomee, 2003, p. 10). Further roots of the white population lie in the initial British colonization of the Cape in 1795. Slaves were imported to South Africa from 1658 onwards, initially from West Africa, Madagascar, Mozambique and East Africa (Giliomee, 2003, p. 12). Later on, many slaves were sourced from Ceylon, Batavia (Java), India and China (Giliomee, 2003, p. 15).

Amongst the initial white settlers in the Cape, a dialect of the Dutch language grew into a fully fledged independent language called Afrikaans. Afrikaans is:

> *". . . one of four languages in the world – Hebrew, Hindi and Indonesian are the others – which, in the course of the twentieth century, were standardized and used in all branches of life and learning . . . "*
>
> (Giliomee, 2003, p. xvii).

Part of the white population, which no longer had ties with Europe, used Afrikaans extensively and became known as Afrikaners. The British stigmatized the Afrikaans language as a "...mongrel language, and as the language of the uneducated" (Giliomee, 2003, p. 224) which lead to great tension between the Afrikaner and the British.

The above mentioned mixture of various racial and language groups, together with the political ideology of each phase of South African history, presents a complex and rich backdrop against which the history of higher education and case data will be explained. These factors are important in the interpretation of the case data.

1.2.2.2 History of South African HE

Behr (1987, p. 168) states that higher education, and especially university education in South Africa, is strongly rooted in the British system. The foundation of university education was laid in the last century in the Cape Colony. The first institution, the South African College, was opened in 1829. It adopted a British tradition, modelled on the then University of London, and is now called the University of Cape Town (Behr, 1987).

During the 1960s, South African universities, though not excluded from the wave of world-wide changes in higher education, focused on the establishment of separate university facilities for different race and language groups. The fragmented strategy for higher education was based on the political ideology of the day (Behr, 1987, p. 169). The 1948 apartheid government's political ideology resulted in segregation of privileges and rights according to race group. People were categorized into four race groups: white (people of European descent), black (consisting of indigenous African black people), coloured (people of mixed race) and Asian (people of primarily Indian and Chinese origin). The white population group was afforded the right to vote and the other race groups were disempowered at all levels. Racial segregation was also applied to educational policy at all educational levels, including higher education. The resolve of the 1948 government to uplift the white Afrikaner gave rise to further segregation, this time along cultural/linguistic lines: the white population was divided into the two official languages – namely Afrikaans and English – and educated accordingly. Therefore, in higher education there were institutions for the coloured,

Asian and black race groups, and these institutions predominantly taught in English. Furthermore, there were institutions serving the English-speaking white population and institutions serving the Afrikaans-speaking white population. This meant that there was little interaction between academics from the different race-based institutions, as well as between those from Afrikaans- and English-medium institutions. Research by academics from Afrikaans-medium institutions, especially in the social sciences, was belittled by their English counterparts (Behr, 1987, p.171).

The languages of the indigenous people of South Africa were marginalized and in the 1970s the Nationalist government embarked on a campaign to make Afrikaans the language of instruction at all primary and high schools. This sparked the 1976 student revolt, which many see as a turning point in the struggle against apartheid.

The segregated HE system caused disparate levels of educational preparedness among students from different race groups, with the majority of funding and resources invested in white education (both English and Afrikaans). It was not until 1983 that the South African government took steps to make universities more accessible by allowing the intake of different race groups at all institutions. The State controlled historically black universities tightly whilst allowing historically white universities a great deal of autonomy.

South African education and training reflected all the imbalances, all the injustices and the separateness of the ruling apartheid ideology (Bellis, 1998, p. 156). The fragmentation of the higher education sector has led to restricted access for previously disadvantaged communities into HE institutions and also, in the absence of a unified educational approach or qualification structure, to unplanned and uncoordinated national goals. This fragmentation meant that the higher education sector was unable to respond to the economic and social needs of the majority of the South African population. Furthermore, research output varied among the historically white and black universities. This was largely a consequence of inequitable funding allocation, human resource skills shortages, and the pre-occupation of many historically black universities with the struggle against apartheid. Together with this, democracy and representativeness (race and gender) is still sorely lacking, especially in management and lecturing positions at most HE institutions. Last but not least, the impact of

segregation on the student population is evident in a divided workforce, with the majority of the black population working in unskilled or semi-skilled positions, and many skilled (predominantly white) workers leaving for Europe and the USA. This has resulted in professions losing their most skilled workers, not to mention the social and psychological inheritance plaguing the country.

1.2.2.3 Previous South African HE sectors

Until 1997, South African HE consisted of three sectors: the university, technikon and college sectors. The university sector was intended to "...educate students in a range of basic scientific (or scholarly) disciplines with a view to high-level professional training" (NCHE, 1996, p. 2) and had to engage in basic scientific research. The technikon sector was required to train students in the application of knowledge itself with a view to high-level career training, and engaged in developmental scientific research. The college sector prepared students for specific vocations and did not conduct research at all (NCHE, 1996, p. 2).

Before 1993, technikons did not have the authority to award degrees. Therefore the qualifications from technikons and universities were separated into diplomas and degrees respectively. This also meant that until 1993 technikons were not really actively engaged in research, and instead emphasized teaching as their core mission. Funding for research was also not allocated to technikons by government until 1993 (Ogude *et al.* 2001, p. 2). Chetty (2003, p. 10) states that

> *"[technikons'] higher degrees are not viewed as a gateway to a post-doctoral research career. The anti-intellectualism runs through the system from top to bottom".*

Each sector was governed by and differentiated from other sectors through separate Acts (Universities Act 61 of 1995, Technikons Act 125 of 1993, Tertiary Education Act 66 of 1988). Major reforms in higher education commenced in late 1995, and the abovementioned Acts were repealed on 19 December 1997 and replaced by the Higher Education Act 101 of 1997 and its recent amendments (Act 55 of 1999, Act 54 of 2000, Act 23 of 2001).

Until 1997, curriculum development at technikons was skewed by tight national control, whilst universities had full institutional control of the curriculum process. This resulted in great emphasis on autonomy and academic freedom by the university sector, in contrast with the technikon sector's apparent acceptance of external control and co-ordination. Internal governance arrangements were also fervently guarded by universities, who refused external interference by the Department of Education (DoE), whilst the technikon and college sectors followed the instructions that the DoE mandated.

1.2.2.4 New unified HE system

Presently, the terms 'university' and 'technikon' are not defined in the Higher Education Act (1997), and instead all levels of education are unified in a new system containing three bands based on an integrated National Qualifications Framework (NQF). The three bands are (from the bottom): the General Education and Training band (GET), which includes schooling or Adult Basic Education and Training until Grade 7 (starting from Grade 0 schooling). GET is followed by the Further Education and Training band (FET), which includes schooling and other forms of education offered by institutions such as colleges (and sometimes technikons) up to the Grade 12 level (final schooling exit level). The FET band is followed by the Higher Education and Training band (HET). Technikons and universities operate in this band together with training providers that have registered their course offerings with the South African Qualifications Authority, and these courses are therefore deemed to be of a similar level of complexity to technikon and university qualifications. The government department that regulates all bands of education, including higher education, is the national Department of Education (DoE). The HET band recognizes institutions that are registered by the Minister of Education through the DoE and these institutions are classified as either public or private. Only public institutions receive government funding.

1.2.3 RESTRUCTURING OF SOUTH AFRICAN HE

The National Commission on Higher Education (NCHE) was formed in February 1995 to investigate the transformation of higher education. The Commission had to advise on issues of restructuring higher education to ensure a well-planned, integrated and high-quality system for higher education in South Africa (NCHE, 1996, p. 1). The

NCHE Report of 1996 leaned towards the post-modern discourse on the role of a university in developing countries, indicating that South African universities should become "...engines of development and centres and conduits for innovation" (Cloete & Muller, 1998, p. 3). The NCHE report, *A Framework for Transformation* (September, 1996), proposed three pillars for HE transformation: increased participation, greater responsiveness and increased co-operation and partnerships (CHE, 2004, p. 25).

The National Commission on Higher Education (1996) was followed by a Green Paper on Higher Education, which endorsed the majority of the recommendations of the NCHE except those concerning governance (Reddy, 2003, p. 34). Instead of accepting the NCHE recommendations of two statutory bodies for HE, the Green Paper, followed by the 1997 White Paper, accepted a unified body called the Council on Higher Education (CHE) as the governing body for higher education, reporting to the Minister of Education. The 1997 White Paper emphasized that HE had to be planned, funded and governed as a single coordinated system (CHE, 2004, p. 26). A higher education plan with benchmarks for transformation, institutional three-year rolling plans, as well as a goal-orientated performance-related funding system, were outlined as policy instruments to ensure the responsiveness of the HE system (CHE, 2004, p. 26; Reddy, 2003, p. 36). The CHE would furthermore ensure quality in higher education through its Higher Education Quality Committee (HEQC) by way of programme accreditation and institutional audits.

The National Plan for Higher Education (DoE, 2001) was the next policy framework after the White Paper of 1997 (CHE, 2004, p. 26) and contained the formal targets for the size and shape of higher education. The Plan included benchmarks for student participation as well as the National Higher Education Information and Applications Service which would monitor more equitable race and gender access to HE. Furthermore, the National Plan focused on the following, according to the CHE (2004, p. 28):

- Diversity of institutional mission and programme differentiation. Institutional missions are no longer directed through a definition in the Higher Education Act, but instead institutions have to indicate their focus (within the boundaries of a framework) and they are quality assured against that mission statement.

Programme differentiation is enforced per institution through an approved Programme Qualification Mix matrix (PQM) which stipulates which programmes in specified academic disciplines an institution is allowed to present.

- Restructuring of the institutional landscape through a reduction in the number of HE institutions, based on the recommendations of a National Working Group.
- The building of research capacity through a new approach to research funding and an emphasis on research output as well as an increase in postgraduate research students.

The National Working Group (NWG) was appointed in March 2001 by the Minister of Education to investigate the restructuring of the institutional landscape (CHE, 2004, p. 43). The NWG's recommendations were not adopted entirely by the Minister of Education and instead certain institutions that were declared unsustainable and poorly governed by the NWG were retained as independent institutions in the merger and incorporation plan that followed the Minister's presentation to Cabinet at the end of May 2002. Some of these institutions were very active in the struggle against apartheid, while others were traditionally 'liberal', and publicly supported the struggle against apartheid, and were therefore left untouched by the restructuring process. In essence, educational policy was once again, like the history it was trying to escape, tainted by political considerations. Jansen (2000 cited in Chetty, 2003, p. 9) states that the restructuring of HE "...hinged largely on political symbolism rather than substance of change in education". The process that occurred following the NWG report in January 2002 is described as "...a period of consultation and lobbying and in some cases acrimonious encounters between Minister and institutions ..." (CHE, 2004, p. 44). The dramatic restructuring of HE institutions from 36 to 22, plus two National Institutes, is illustrated in table 1-1. A further development flowing from the restructuring plan was the formulation of a new type of higher education institution termed a 'comprehensive' institution. Comprehensive institutions are defined as higher education institutions where both university-type and technikon-type qualifications are offered. Following the restructuring plan, mergers and incorporations commenced in 2004.

Table 1-1: The new institutional landscape of SA public HE (Adapted from CHE, 2004, p. 50; DoE, 2002)

Institutional type		Institutions (comprised from former institutions in brackets)
Universities	8 separate and incorporated universities	1. University of Cape Town 2. University of Fort Hare (UFH + Rhodes University East London campus) 3. University of the Free State (UFS + Vista University (Bloemfontein) + University of the North (Qwa-Qwa)) 4. University of Pretoria (UP + Vista University (Mamelodi)) 5. Rhodes University 6. University of Stellenbosch 7. University of the Western Cape (UWC + University of Stellenbosch Dental School) 8. University of the Witwatersrand
	3 merged universities	9. University of KwaZulu-Natal (University of Durban Westville + University of Natal) 10. University of Limpopo (University of the North + Medical University of South Africa) 11. North-West University (Potchefstroom University of Christian HE + University of the North-West + Vista University (Sebokeng – staff and students))
Universities of Technology	2 separate and incorporated (technikons) universities of technology	12. Central University of Technology (Technikon Free State + Vista University (Welkom)) 13. Vaal University of Technology (Vaal Triangle Technikon + Vista University (Sebokeng – infrastructure and facilities))
	3 merged (technikons) universities of technology	14. Cape Peninsula University of Technology (Cape Technikon + Peninsula Technikon) 15. Durban Institute of Technology (DIT + Mangosuthu Technikon + University of Zululand infrastructure & facilities of Umlazi campus) 16. Tshwane University of Technology (Technikon Pretoria + Technikon Northern Gauteng + Technikon North-West)

Institutional type		Institutions (comprised from former institutions in brackets)
Comprehensives (combination of a university and a university of technology)	2 separate comprehensives	17. University of Venda for Science and Technology (University of Venda) 18. University of Zululand
	4 merged comprehensives	19. University of Johannesburg (Rand Afrikaans University + Technikon Witwatersrand + Vista University (East Rand and Soweto)) 20. Nelson Mandela University of Technology (University of Port Elizabeth + Port Elizabeth Technikon + Vista University (Port Elizabeth)) 21. University of South Africa (UNISA + Technikon South Africa + Vista University Distance Education Centre) 22. Walter Sisulu University of Technology and Science (University of Transkei + Border Technikon + Eastern Cape Technikon)
National Institutes (In two provinces where there are no formal HE institutions)		23. Mpumalanga Institute for Higher Education 24. Northern Cape Institute for Higher Education
Total		22 + 2 National Institutes

1.2.4 THE SOUTH AFRICAN UNDERSTANDING OF HE TRANSFORMATION

The legacy of segregation in South African higher education has meant that unique measures had to be taken to ensure that higher education remains relevant and responsive to the needs of society. Many of these unique measures, such as the restructuring of HE, are based on the premise of transformation to redress racial inequities. As a point of departure the word 'transform', in the context of English language interpretations of Roget's Thesaurus (2002, with first addition in 1852), means to modify, revolutionize, influence, make better, or pervert. 'transformation', which derives from the word 'transform', therefore does not necessarily imply something positive but could also connote 'deterioration'. In other words, to transform something or somebody is not necessarily a step forward. Therefore, transformation should be examined from a policy documentation viewpoint and against the goals of the National Plan for Higher Education of 2001.

The aim of the new democratically elected government is to provide 'a better life for all' through comprehensive transformation (CHE, 2004, p. 14). One of the vehicles through which government can achieve this comprehensive transformation is higher education. The National Plan for Higher Education (DoE, 2001, p. 8) states that the *role of higher education* in a knowledge-driven world is three-fold (South Africa, 1997b, p. 12):

1. "Human resource development . . . ;
2. High-level skills training . . . ;
3. Production, acquisition and application of new knowledge . . . "

Higher education is therefore firmly positioned as the custodian of public goods such as trained and highly skilled people, and is underpinned by the development of new knowledge.

The Council on Higher Education sees transformation as a double challenge for South African higher education (CHE, 2004, p. 2). The first challenge is the historical context of South Africa and the second the global context and globalization. The historical context contains challenges such as the legacy of apartheid, social equity, economic growth and development, as well as building and consolidating democracy. Mouton (2004) describes this as the 'transformation discourse' where redress and equity and a demand for a more representative scientific workforce in terms of race, gender and age take primacy (White Paper on Science and Technology, 1996, National Plan for Higher Education, 2002 cited in Mouton 2004).

The second challenge, namely global issues, is described as the global competitive economy and all issues pertaining to South Africa's readiness and ability to participate in global activity (CHE, 2004, p. 2). Mouton (2004) states that the globalization paradigm is fuelled by competitiveness among nations and HE institutions. He adds a third challenge, which he calls the accountability discourse, in which new public management features strongly. Therefore, in the South African context, HE transformation is based on two components. The first is internally directed and deals with the social and economic legacy of apartheid. The second

component is externally focused and deals with South Africa's ability to compete in the global arena.

Another way in which to view South African HE transformation is to see that it has a historical redress agenda, as well as a performance agenda, in which effectiveness and efficiency are of prime importance. In essence, the globalization and accountability discourses give rise to demands for effectiveness and efficiency. At the bottom of figure 1-1, the main factors that have given rise to the need for transformation in the HE system are indicated in green. The CHE indicates that the transformation process contains three policy goals for higher education: equity and democratization; effectiveness; and efficiency (CHE, 2004, p. 3).

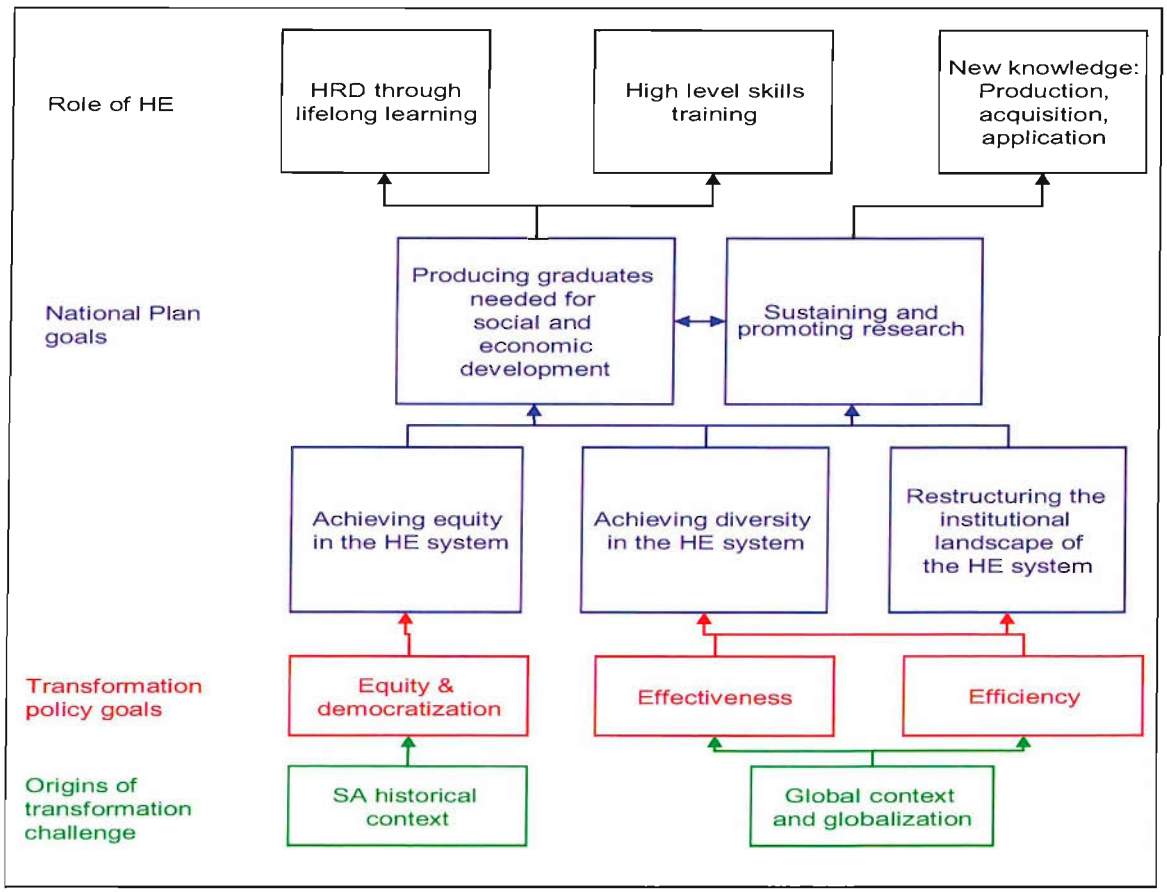


Figure 1-1: Meaning of 'transformation' in context of other HE policy goals

Figure 1-1, furthermore, assists in highlighting the fact that, for South Africa, the concept of 'equity and democratization' carries a unique, more pronounced priority than it would in the developed world, due to the history of the country. In the same manner, the National Plan goals of 'producing graduates needed for social and

economic development' as well as the goal of 'sustaining and promoting research' could be viewed as generic goals that all HE systems worldwide should have. These two goals directly support the three roles that are given to higher education in the National Plan. The other three goals of the National Plan – 'achieving equity in the HE system', 'achieving diversity in the HE system' and 'restructuring the HE institutional landscape' – are, however, directly linked to the transformation policy goals. These three National Plan goals are actions that directly enable fruition of the transformation policy goals.

In summary, 1-1 depicts the notion of transformation in HE globally, except for two differences: the origins that underpin the transformation and the search for excellence. The South African HE history of educational segregation, deprivation according to race and gender, and the associated uneven economic development and the withholding of opportunities for participation, create a context where urgency drives the redress agenda. This sense of urgency is, for some, so overwhelming that redress defines transformation. If transformation is applied in this manner, the full spectrum of the role of HE will not be achieved. Both the efficiency and effectiveness transformation policy goals cannot be achieved without the necessary human expertise in the HE system. Executing change by solely focusing on the redress issues without planning for people development, which includes the sharing of expertise, could negatively impact the other goals of HE transformation, namely the effectiveness and efficiency goals. Excellence, as a fourth transformation policy goal, could be the balancing factor that will mitigate policy and management decisions primarily based on the narrow 'redress' definition of transformation.

Section 3

1.3 THE SOUTH AFRICAN RESEARCH CONTEXT

In this section the history of research in South Africa and recent developments in South African higher education research will first be discussed. This will be followed by an analysis of the higher education research outputs as recognized by the national Department of Education. The section is concluded by discussing South African research imperatives.

1.3.1 HISTORY OF RESEARCH IN SOUTH AFRICA

In the mid-eighteenth century, South African research was born from the works of amateur natural historians and astronomers who travelled to the Cape Colony to satisfy their intellectual curiosity (Bawa & Mouton, 2002, p. 297). This search for answers developed into a major science base on the African continent. More formalized and institutionalized modes of knowledge production in the nineteenth century were followed by the discovery of gold which spurred mining and engineering, and the establishment of major research centres (most notably the Onderstepoort Veterinary Institute), at the beginning of the twentieth century. At this time, science came into being as an entity with its heart in universities. Universities were to produce the 'nation's' (divided since the whole nation was not included) political leadership, provide its creative energy and become a custodian for its cultures and traditions.

In 1946 the Council for Scientific and Industrial Research (CSIR) was established. The CSIR was the biggest science laboratory in the country, outside university centres. The Human Sciences Research Council (HSRC) was later established as the human sciences laboratory of the State. When the Nationalist Government came into power in 1948, its apartheid policies dictated a growing emphasis on strategic research within the science councils. Billions of rand were spent on military and defence research and development. During this time, the development of a segregated higher education system occurred.

The dominant white grouping of the country shaped the national system of higher education and research. Research into many high-level scientific projects, for example the atom bomb project, proved South Africa's considerable expertise in the nuclear sciences. The arms embargo and other forms of sanctions that were directed at the country (the academic boycott, for example), encouraged this focus on high-level scientific projects. The upside of isolation was that the research systems at universities in the natural and applied sciences were greatly enhanced. Research in the social sciences, however, did not receive the same boost, as social scientists received little, if any, recognition outside the country's borders. The consequence of this, according to Bawa and Mouton (2002, p. 299), was "...a social sciences research system that was insular and marginalized in the global context", whilst international recognition for research findings in the natural and applied sciences continued unabated during this time.

In 1990, when the release of Nelson Mandela and other African National Congress (ANC) political prisoners was imminent, the ANC commissioned a study to review the state of science in South Africa. The findings of the studies indicated clearly that the country's substantial research system was hopelessly disarticulated from the needs of the majority of South Africans. In the words of Bawa and Mouton (2002, p. 299),

> *"...research capacity and excellence in the areas of infectious diseases or community-based medicine was hopelessly lacking at a time when Chris Barnard performed the world's first human heart transplant operation".*

The second finding of the ANC-led investigation was that the national science system was deeply fragmented and uncoordinated. The third was that the science system was ineffective and inefficient, which indicates why these two aspects are addressed in the present policy goals of transformation in HE.

1.3.2 RECENT DEVELOPMENTS IN SA HE RESEARCH

1.3.2.1 Higher education developments

After the findings of the ANC-led investigation were announced, a set of policy development exercises followed, such as the White Paper on Science and Technology (1996), resulting in the establishment of the National Research Foundation (NRF),

and the National Advisory Council on Innovation (NACI). The NRF is the government's national agency to support and promote research through funding of research in the social sciences, humanities, natural sciences and technology (NRF, 2005a). Furthermore, the NRF assists with funding programmes for researcher development and the provision of research facilities. The NRF reports to the Minister of Science and Technology. The NACI advises the Minister of Science and Technology

> *"...on the role and contribution of science, mathematics, innovation and technology, including indigenous technologies, in promoting and achieving national objectives"*
>
> (NACI, 2005)

A second set of policy developments was directed at higher education research policies. The White Paper on Higher Education Transformation of 1997 drew heavily on the NCHE's report of 1996 and announced that: "...the production, advancement and dissemination of knowledge and the development of high level human resources are core functions of the higher education system". The White Paper highlighted the Mode 1 and Mode 2 knowledge production debate, as defined by Gibbons *et al.* (1995), and made a strong case for HE institutions to move toward Mode 2 research (which will be discussed in the next chapter).

The National Plan for Higher Education that followed in 2001 identified, inter alias, the acquisition and application of new knowledge as a key challenge facing higher education (Bawa & Mouton, 2002, p. 302). Table 1-2 provides a summary of the priorities and strategies for effective HE research.

Table 1-2: List of priorities and strategies to support effective HE research

Adapted from the White Paper of 1997 and the National Plan of 2001 (cited in CHE, 2004, pp. 109-110).

- Increased postgraduate enrolments and outputs (emphasis on black and women students);
- Enhancement of institutional research outputs and quality;
- New centres of excellence to be developed by HEIs with demonstrable research capacity or potential;
- Increase in collaboration and partnership, especially regionally;
- Greater articulation and coordination of research activities in the national system;
- A national research plan should be compiled – setting out priorities for research and post graduate training, processes to identify centres of excellence, equity targets and incentives for collaboration and partnerships; and
- New research funding system through a block grant system.

A new funding formula from the DoE for higher education was announced in November 2002 (DoE, 2002b) to replace the current *SAPSE* (South African Post Secondary Education) research subsidy system. The new funding framework is based on the premise that

> *"Government funds for higher education institutions are not . . . designed to meet specific kinds or levels of institutional cost, but are intended rather to pay institutions for delivering the teaching-related and research-related services specified by government-approved plans"*
>
> (DoE, 2002b, p. 6)

The funding framework is based on block funds as well as earmarked funds for specific developmental purposes. Block funds are made up of (DoE, 2002b, p. 6):

- Research funds generated by approved outputs;
- teaching funds generated by (a) planned full-time equivalent (FTE) student enrolments according to the PQM and (b) by approved teaching outputs; and
- institutional factor funds (i.e. institutional set-up funds according to a formula applied to teaching input figures).

Research output is measured according to the units of publication in ISI-accredited journals (Institute for Scientific Information), other DoE-accredited journals, books and other specified research publications.

Government has 'incentivized' research funding. Institutions that increase their research output beyond their current baseline output are able to obtain more of the total portion of research funds that government has earmarked for the HE sector. In other words, these institutions can increase their research income share, thereby receiving a share of research funds of institutions that are under-achieving in research output. Institutions that are serious about research, therefore, cannot afford a decrease in research output for even one year.

1.3.2.2 Science and Technology developments

In tandem with the HE policy process, which included research, the Science and Technology (S&T) policy process overhauled the entire S&T system. The national S&T system consists of science councils, the private sector, non-governmental organizations, government and HE institutions; these elements exist within a *National System of Innovation* (NSI) (CHE, 2004, p. 106). The notion of an NSI creates an environment in which the fragmented research bodies and activities could be integrated into a cohesive system. The aim of creating a national integrated research plan as articulated in the HE policy documents (refer to table 1-2) was bolstered by the publication of a National Research and Development Strategy in 2002 (CHE, 2004, p. 110). Higher education institutions form part of the NSI but their research priorities and policies fall under the national Department of Education.

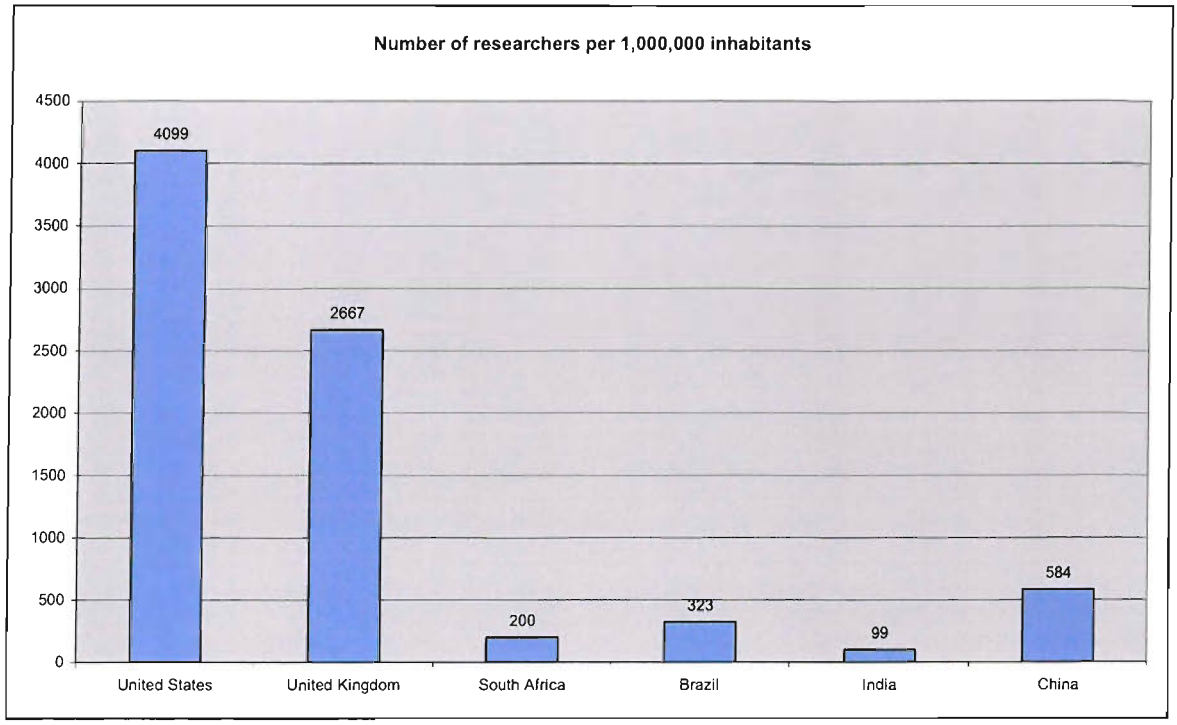
1.3.3 SCIENTIFIC OUTPUT

The most comprehensive bibliometric analyses of South African science have been undertaken by Pouris (1996, cited in Bawa & Mouton, 2002, p. 310) and was based on scientific output in the ISI-accredited journals. No other intensive study of this nature has been conducted since 1996. Furthermore, official higher education scientific output statistics at time of publishing this thesis are only available until 2001.

Pouris identifies a steady decline in South African scientific output since 1996. He shows the number of publications by South African authors as relatively stable (approximately 3300 per year between 1987 and 1994). When compared to other countries and calculated as a proportion of world output, however, the steady decline becomes apparent. Countries that were on par or below South Africa in 1987 surpassed South African output between 1987 and 1994. These countries are Norway, South Korea, Brazil, Taiwan and the People's Republic of China. Between 1980 and 1987 South Africa's output as a proportion of world science output increased from 0.4% to nearly 0.7%. Peaking during 1987, this output remained the same until 1994, with a drop back to 0.4% of world output. In 1994, South Africa had about 0.5% of the world's scientists. A possible explanation for the dramatic decline in research output could be the brain-drain, both through emigration and through academics taking up positions in government during the mid-1990s. Actual research output usually lags behind by approximately two years as a result of publication delays, so the actual research productivity of 1994 would only become measurable in 1996. Many policy initiatives were also launched during this time, such as the establishment of the South African Qualification's Authority, and this took considerable time-commitment from academics to redesign curricula to reflect outcomes-based education.

Data on which the Pouris (1996, cited in Bawa & Mouton, 2002, p. 310) analyses were based reflects only a portion of South African science output, given the very small representation of South African journals in the international ISI-indices (only 31 South African journals out of a total of 205 national Department of Education-accredited journals). Bawa and Mouton (2002, p. 309) conclude that higher education represents approximately 35% of total public (state-sponsored) research and development expenditure in the country, but that the research output in this sector has steadily decreased since 1994.

1.3.4 POOL OF RESEARCHERS



Notes:

- Population data: United Nations Population Division (UNPD), 2002 revision. UNPD does not provide data by single year for countries with a total population of less than 80,000. Where no UNPD estimates were provided national data was used where available.
- Science and Technology (S&T) data: UNESCO Institute for Statistics (S&T survey); Organization for Economic Co-operation and Development (OECD); Statistical Office of the European Communities (Eurostat); Ibero American Network on Science and Technology Indicators (RICYT).
- All S&T statistics refer to the most recent available data between the years of 1996 and 2002. Population statistics refer to 2001.

Figure 1-2: Number of researchers per 1,000,000 inhabitants of a country (UNESCO, 2005).

The challenge faced by developing nations in retaining their researchers, and thereby grow their capacity in research, is illustrated through the UNESCO country profiles of educational statistics (UNESCO, 2005) for 2001, as illustrated in figure 1-2. Figure 1-2 compares the number of researchers per million inhabitants per country. I have

compared the USA and the UK, as developed nations, with China, Brazil, India and South Africa, as developing nations. Figure 1-2 illustrates the big divide between developed and developing nations. This large difference in numbers of researchers could be a consequence of the brain-drain from developing nations, together with the developed nations' strong emphasis on the creation of opportunities for, and excellent funding of, research.

1.3.5 NATIONAL HE RESEARCH IMPERATIVES

1.3.5.1 Shifts in types of research

There has been a move away from basic and fundamental research towards the support of strategic and applied research in South Africa (Bawa & Mouton, 2002, p. 315). The National Research and Technology audit of 1995/6 classified half of the research in the higher education sector as basic research – whereas, by comparison, three-quarters of all research in the higher education sector during 1991 was classified as basic research. Half of the research classified during 1995/6 as basic is further categorized by academics into strategic research, while the remaining half is seen as fundamental research. The audit further indicated that 37% of research is applied research, and 13% is related to product-related work, resulting in contract income at higher education institutions growing dramatically in the past five years. In terms of the type of research conducted, the NACI Survey on Research Utilization (2003, cited in CHE 2004, p. 123) indicates that, nationally, 30% of university researchers disseminated their research through contract reports, as compared with 16% of technikon researchers. This is surprising, given the fact that technikons (or universities of technology) are traditionally involved in industry and applied-type research. The NACI survey confirms the fact that universities have surpassed the technikons in the production of applied and industry-type research (also referred to as Mode 2 research).

1.3.5.2 Race and gender equity in South African research

The national research output of the historically white Afrikaans-medium universities increased from 37.2% in 1986 to 41.5% in 1999 (Bawa & Mouton, 2002, p. 318). The proportion of research output from the white English-medium institutions declined substantially from 53.5% in 1986 to 37.9% in 1999. The contribution of the historically black institutions has risen dramatically from a base of 5.1% in 1986 to

10.7% in 1999. This indicates that redress is slowly but surely being filtered through, although the research output at the historically black institutions is shared by only two institutions, namely by the University of the Western Cape (an institution founded to cater for the coloured population grouping) and the University of Durban-Westville (an institution founded to cater for the Asian population grouping). The majority of research outputs are still produced by white academics – with white academics at historically Afrikaans-medium institutions increasingly taking the lead. Until the recent HE restructuring, historically Afrikaans-medium campuses were stable, with good management of student debt. In contrast the historically English-medium and other HE institutions experienced tremendous academic brain-drain and were not always successful in controlling student debt and managing student expectations. However, race and gender personnel inequalities have not been addressed at most institutions. Women authors still only contribute approximately 20% of the total national research output, although this has remained steady in the face of declining overall outputs (see figure 1-3).

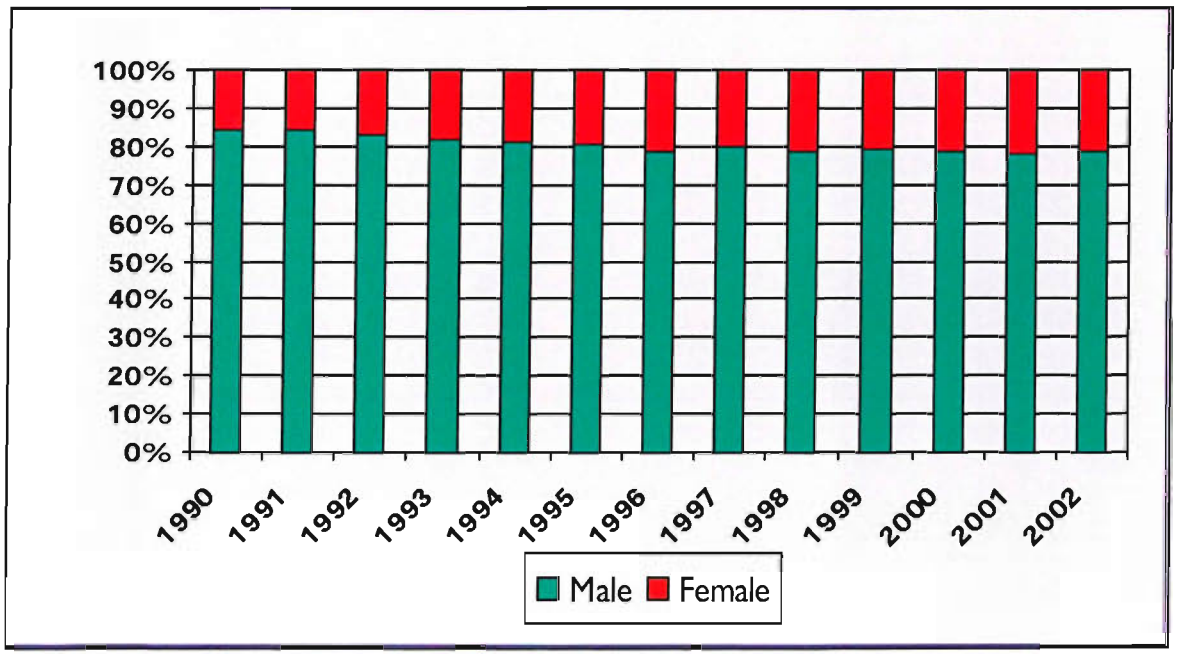


Figure 1-3: Gender trends in national scientific outputs (from Mouton, 2004)

As far as *age equity* is concerned, persons in the 40-49 age bracket are responsible for more than 40% of the total national articles published. This correlates well with international trends (Teodorescu, 2000), which suggest that the age and maturity of academics have an influence on research output which could be attributable to more

time for research, as well as maturity in the academic discipline (Bawa & Mouton, 2002, p. 322).

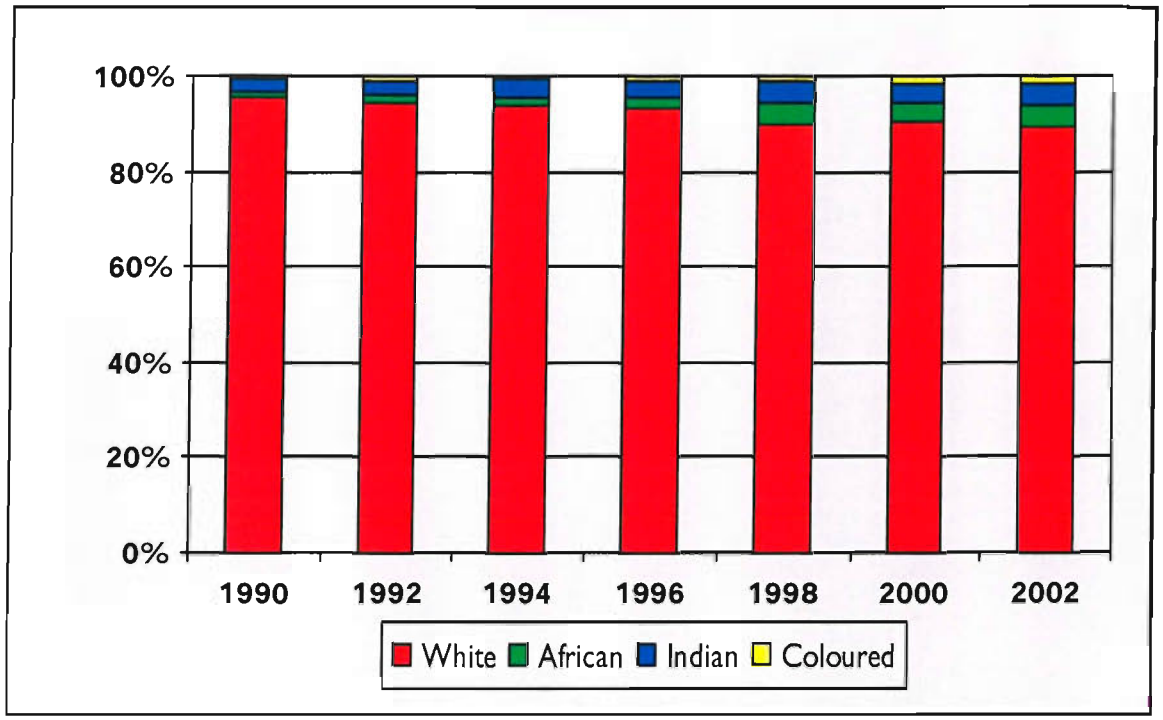


Figure 1-4: Racial grouping trends in national research output (from Mouton, 2004)

Racial equity, as depicted in figure 1-4, has improved marginally. Figures 1-3 and 1-4 illustrate clearly that white male academics are producing the bulk of the research output.

1.3.5.3 Institutional-type imperatives

Figure 1-5 shows the contribution of old and new HE institutional-types to the total national research output for the HE sector. Figure 1-5 is, according to the new funding formula, also representative of the slice of national research funds that will be distributed to the different institutional types. There are 11 universities that will share 82% of the total national budget for HE research. Five of these 11 universities dominate higher education scientific output: the universities of Cape Town, Natal, Pretoria, Stellenbosch and the Witwatersrand. Their combined output amounts to approximately 62% of the national output (CHE, 2004, p. 117) and they will therefore share 62% of the 82% of the national HE research budget. As is the case with the HEFCE research funding in the UK, research funding in South Africa is predominantly allocated to research-intensive institutions.

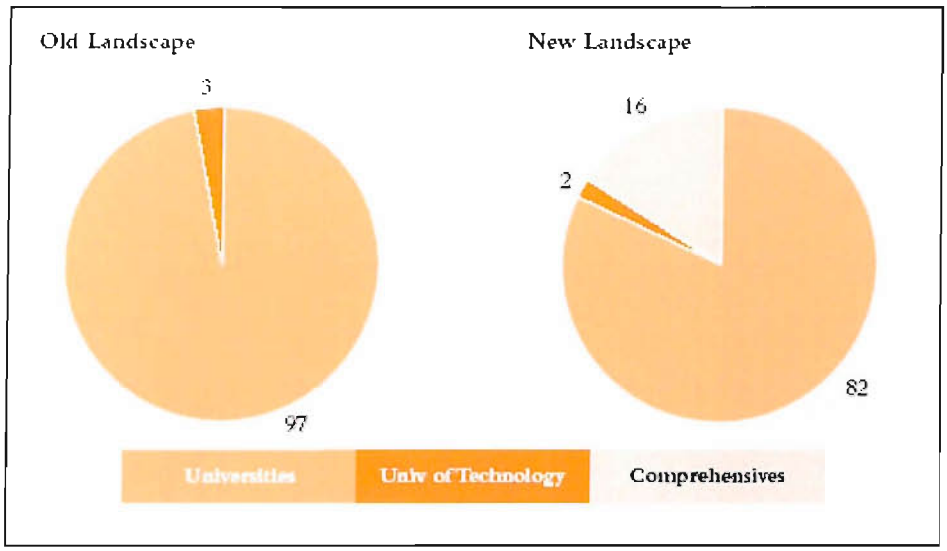


Figure 1-5: Distribution of SAPSE output by old and new institutional-types (from CHE, 2004, p. 120)

As regards the comprehensive institutions, 6 universities will share in 16% of the total national budget for HE research. This is important, since the two case institutions under investigation in this thesis became a comprehensive university on 1 January 2005.

1.3.5.4 Quality and scientist evaluation

The National Research Foundation (NRF), apart from its funding function, also evaluates scientists by assessing their expertise and benchmarking it against that of their peers for quality assurance purposes (NRF, 2005b). Evaluation occurs for all types of academic disciplines and fields. During 2003 South African technikon-type institutions had a total of 41 NRF-rated scientists (NRF, 2005c). In the same year, universities had 1265 rated scientists, of which only 44 were 'A'-rated, indicating that they are unequivocally recognized by their peers as leading international scholars in their field (NRF, 2005c). There are no 'A'-rated scientists at any technikon-type institution. The NRF evaluation of scientists is commonly accepted amongst scientists from the natural sciences but scientists from the social sciences and humanities perceive bias in the evaluation criteria skewed towards norms in the natural sciences. The latter grouping is therefore not entirely accepting of the NRF scientist evaluation outcomes. One of the criteria in the 'A' rating of scientists is that work has to be internationally known. Criticism in this regard has been levelled at the evaluation system, as it prejudices authors who have primarily published in Afrikaans or another

indigenous language. Furthermore, authors in the humanities and social sciences sometimes work on indigenous knowledge systems, which are sometimes only of use in South Africa. Many authors also publish in national journals that may not be listed in the ISI-indices.

Section 4

1.4 CASE INSTITUTIONS' STATISTICS

Two institutions form part of the case under investigation. One of these is a university with a history of being an Afrikaans-medium institution, and the other is a technikon. Important statistics and facts relevant to understanding the cases are explained under this section.

1.4.1 REFERENCE TO CASE INSTITUTIONS

For purposes of the study the two case institutions will be referred to as follows:

- The university partner to the merger will be referred to as the university;
- The technikon partner to the merger will be referred to as the technikon; and
- The new comprehensive university that will be formed after the merger will be referred to as the merged university.

1.4.2 RESEARCH OUTPUT

The university has produced the most research nationally, measured by the average output per academic staff member (1.08 output per staff member in 1995 and 0.89 output per staff member in 2001) (CHE, 2004, p. 121). The technikon achieved, at its highest level, 9.14 research outputs for the total institution during 2000 (DoE, 2002a).

1.4.3 NRF SCIENTIST EVALUATIONS

In 2003, the technikon had 3 rated scientists, while the university had 57 – of which 2 were 'A'-rated scientists (NRF, 2005c).

1.4.4 STUDENT AND STAFF NUMBERS

Table 1-3 provides the actual student numbers of the university case institution as well as its number of full-time academic staff members. The figures do not represent the part-time adult education students, which increases student numbers to approximately 26 000. During 2004 the institution incorporated two campuses of a

previously disadvantaged institution, which raised the number of students to 30 000. The total number of permanent academics after the incorporation of the two campuses is 537, while the racial composition of academic staff is approximately 25% black and 75% white.

Table 1-3: University student numbers (from institutional statistics)

Faculty of:	Actual student numbers 2000	Actual student numbers 2001	Actual student numbers 2002	Actual student numbers 2003
ARTS	4263	4516	5136	5331
ECONOMIC & MANAGEMENT SCIENCES	4987	5591	6292	7081
EDUCATION AND NURSING	1244	1185	3342	3718
ENGINEERING	678	726	872	909
LAW	1040	987	979	1092
SCIENCE	1542	1693	1985	2107
Total	13754	14698	18606	20238
Academic staff members	346	364	398	411

The technikon's student and staff statistics are presented in table 1-4. Data before 2004 was not available when the preparations for the merger commenced in 2004 and, at the time of the study, the two institutions were guarding their data from each other. Approximately 30% of the academic staff members of the technikon are black and 70% are white (institutional statistics).

Table 1-4: Technikon student numbers 2004 (from institutional statistics)

Faculty of:	Actual student numbers	Actual academic staff members
BUSINESS MANAGEMENT	6757	127
ENGINEERING	4596	162
HEALTH SCIENCES	1891	77
ART, DESIGN & ARCHITECTURE	924	45
TOTAL	14186	411

The percentage of postgraduate students at the university is approximately 30% while at the technikon the percentage is approximately 8% (institutional statistics).

1.4.5 RESEARCH MANAGEMENT HISTORY

University

At the time of the study, the university had just begun formalizing a centralized research management coordination point for the institution, in the office of the Vice-Rector (Research and Academia). However, research management had been a topic of management and institutional discussion for a long time. The university's Board approved a research management structure, including a Dean of Research, for the university during 1983 (Scheepers, 1986). From an interview (Anon, 26 June 2003), it became apparent the demise of the research dean position was due mainly to political and interpersonal pressures. At the inception of the study the deans of faculties were responsible for research co-ordination, since the management of research was devolved to faculty level, as is the case in most collegial governance structures. The Vice Rector fulfils a centralized research support function for the institution, without any additional research management office or staff. The Vice Rector reports to Senate on research matters. The 2003 research policy of the university states that there are two parts to research management: research support and the day-to-day coordination of research. The deans are responsible for the latter, and this includes the control of finance. Furthermore, deans are not expected to give detailed feedback reports to the university top management, and the research outputs and contributions of staff are not closely monitored. Deans are mostly left to their own judgement of required research

output levels and performance measures. During 2003, the Vice-Rector attempted to assume some of the accountability of the deans, and, as could be predicted, encountered vehement resistance.

The following factors contributed to the identification of the university as a case for the investigation of research management:

- Stagnation in research output at 300 publication units per year for the institution (average over years 1997-2001);
- Sharp increases in undergraduate student numbers whilst permanent academic staff numbers remained constant;
- No meaningful additional research income from the National Research Foundation;
- Resistance from academics to be evaluated and rated as scientists by the NRF;
- Unknown contract research income figures for the institution;
- Differences in the importance attached to research in the various faculties;
- Overall uncoordinated research management for the total institution;
- The integration during 2004 of two campuses of a historically disadvantaged institution with extremely low levels of research output;
- The merger during 2005 with a technikon; and
- The decentralized manner in which research is managed at the institution.

Technikon

In 1998, the technikon established a central research office, called the Research Development Unit, manned by a Research Dean and a few administrative staff members. The research management system of the technikon is depicted in figure 1-6. The Research Dean forms part of the institution's executive management committee and reports to the Senate on research matters. Each faculty has a research manager who reports directly to his or her faculty dean. The faculty dean heads a faculty research committee, with a faculty research manager who heads operational matters concerning research in that faculty.

Funds are centrally controlled and the disbursement of research funds occurs according to a strategic plan, drafted by the institution's executive management committee. The research management system was set up to stimulate and support

research activities from a centralized point, since research activity did not occur naturally at the disciplinary level.

The research management system integrates academic promotions in order to align promotions to research output. Academic promotions are very strictly based on research record and can be seen as excluding other forms of academic scholarship.

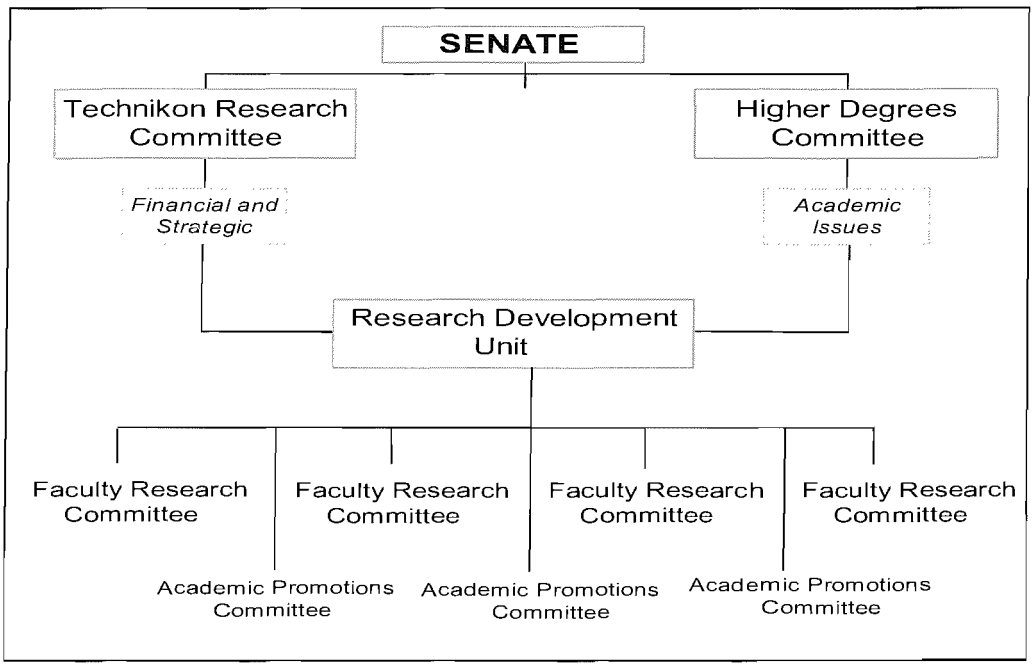


Figure 1-6: Technikon's research management system (from institutional information)

The following factors contributed to the identification of the technikon as a case for the investigation of research management:

- The low research output (average of 8 publication units per year for the institution from 1997-2001);
- The enhancement of academic standards, through research, to fulfil obligations in terms of degree-awarding powers granted in 1993;
- Poor research culture and associated low share in research income from government;
- A growth in research income from the National Research Foundation;
- The centralized manner in which research is currently managed with strong central coordination of research activities; and
- A merger with the university in 2005 to form a comprehensive institution.

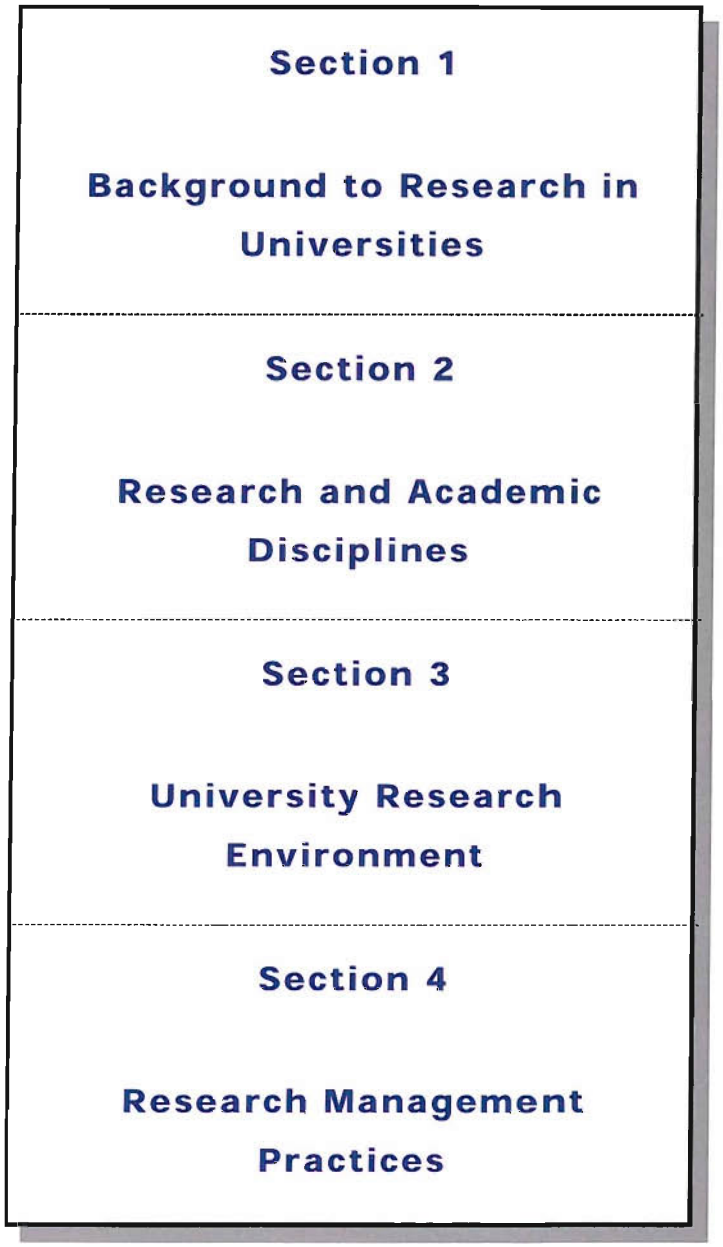
Conclusion

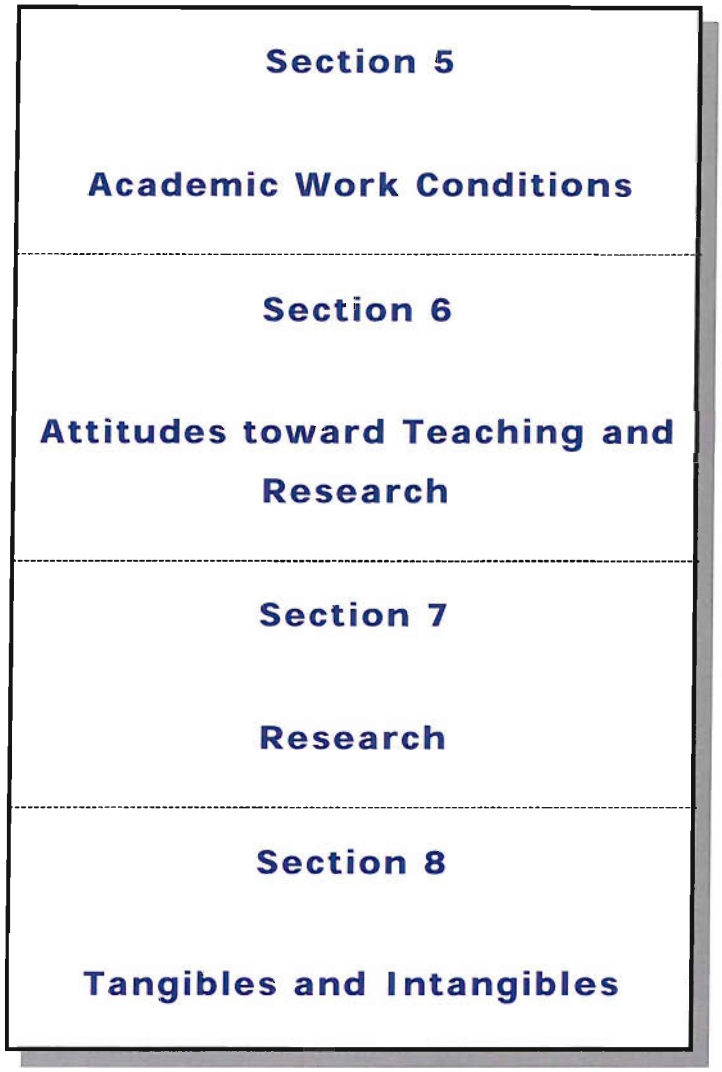
In this chapter I provided an overview of the contribution of the thesis and the origins of the study. The chapter went on to offer an overview of the history and current context of South African higher education which provided the background in which to situate research in South Africa. The chapter was concluded with an overview of the most important statistics and facts of the two case institutions, with the intention of drawing attention to the striking contrast between them. The next chapter will deal with the literature study and will cover the theoretical objectives of the study.

CHAPTER 2

Literature Review

Layout of Chapter 2




Section 5
Academic Work Conditions
Section 6
Attitudes toward Teaching and Research
Section 7
Research
Section 8
Tangibles and Intangibles

Introduction

The purpose of this chapter is to provide an overview of the literature most relevant to my study. The chapter was drafted in two stages: at the outset of the study, to inform the quantitative phase of the study, and thereafter, following the qualitative phase of the study, to verify and contextualize findings (cross referenced in Appendix IV).

The chapter is presented in eight sections. Sections one to seven provide background to question one of the main research questions, namely:

> *What are the factors that influence a productive research management environment at two merging higher education institutions?*

The first section of the chapter covers the background to the research function within universities. This provides a focused context to the study and is written from a global perspective. The second section deals with academic disciplines and their influence on the interpretation of research. The first two sections serve as background to understanding the complexities of research within universities.

Sections three to five provide an overview of aspects of research that are for the most part formally managed within universities. Section three provides a detailed discussion of definitions of research management and research productivity. The structuring of a university is explained together with the uniqueness of knowledge-creating organizations. This is followed by section four, which covers research management practices typically found at institutions. In section five the work conditions of academics and how these conditions influence research are discussed.

Section six deals with attitudes toward teaching and research, as informed by the research and teaching nexus, and interpretations of scholarship. Actors in a university structure, with specific emphasis on researchers and their individual skills and professional activities, are discussed under section seven.

Section eight concludes the chapter and explains the necessity for, and interpretation of, tangible and intangible factors. This section provides background to the second of the main research questions of the study, namely:

> *What are the tangible as well as intangible factors that influence the delivery of research at two merging higher education institutions?*

Section 1

2.1 BACKGROUND TO RESEARCH IN UNIVERSITIES

2.1.1 KNOWLEDGE

Life is a process of continuous change. Continuous change and a growing world population result in the ever-increasing complexity of life – how we understand it and find meaning in it. Human beings have the ability to interpret and investigate their lives, and have an urge to make sense of it. They also have a longing to better their lives – be it materially, socially, spiritually, environmentally or physically. In order to interpret and make sense of life humans cultivate, develop and exploit knowledge.

In a globalized world, given the rapid growth of both technology and the world population, the spread of knowledge and its application in particular contexts is exponentially mushrooming. There are more people investigating more questions, resulting in masses of answers in their particular context. Through technology, any piece of knowledge from any part of the world gets transmitted to its own region or another part of the world and this results in change. The context of knowledge generation, the purpose of it and how it is communicated are of particular interest because, although we live in a global village, the meaning, legitimization and uses of knowledge differ considerably from country to country, between regions and in the context of different people's lives.

Durkheim, 1933 (cited in Jarvis, 2003, p. 2), argued that in the nineteenth century, the "mechanical likeness in society was changing into an organic solidarity through the division of labour, where dissimilarity always plays an important part". Durkheim alluded to the fact that the same findings of research, i.e. knowledge, could no longer be applied to the universe. At the same time he recognized that, since the beginning of time, knowledge had changed – but not at the speed at which it was changing during the nineteenth century, given the rise of the population and the widely divergent opinions that occurred in this period. At the beginning of documented time knowledge was regarded as factual and true – something that could be measured. Theory was

developed and then changed into practice, and facts spoke for themselves "since they contained self-evident truths" (Jarvis, 2003, p. 3). In the current post-modern society, where a market orientation is the ruling orientation, the mainstream legitimization of knowledge comes through pragmatism.

Jarvis (2003, p. 4) further argues that knowledge is also socially constructed. He states that the theories behind the social construction of knowledge (Marx, Engels, Gramsci, Danaher cited in Jarvis, 2003) all point to the idea that knowledge is "...in some way related to the exercise of power in society..." The social construction theory of Marx and Engels in Bottomore and Rubel (1963) holds that "...the class which is the dominant force in society is at the same time its dominant intellectual force". The origin and generator of knowledge is therefore important from the social construction theory perspective, as knowledge may be used for sinister and hidden purposes and the ruling power in the world will vigorously support the generation and spread of its own knowledge in order to maintain its position of power. Ultimately, knowledge drives and sustains power and the notion of the knowledge economy, where economic growth and prosperity are determined by the exploitable knowledge that a nation produces, is elevated in importance.

Howells and Roberts (2000, p. 17) state that

> *"...for the advanced industrialised countries, knowledge is becoming the only resource capable of offering competitive advantage and continued growth and prosperity."*

Since the knowledge economy requires knowledge to move ahead, universities as one of the primary producers of knowledge are discussed next.

2.1.2 UNIVERSITIES

Universities have a proud history of research and are therefore well positioned to generate knowledge. They furthermore have the human competence and mandate to sustain knowledge generation. Universities are ". . . a knowledge-driven industry" (Patterson, 1999, p. 10), and university research is considered a key strength by most developed countries (Larédo & Mustar, 2001, p. 497).

The early history of universities reveals evidence of research at the Lyceum, a university founded by Aristotle, one of Plato's students. At the Lyceum Aristotle taught a variety of subjects and the institution became known as a research institution (Patterson, 1997, p. 17-19). Patterson (1997) also points out that during the nineteenth century in Germany professors were expected to conduct research as part of their duties. Strands of research as part of a university's ethos can therefore be traced back to ancient Greece, but became cemented in the character of universities in Europe during the nineteenth century. It can safely be said that, for many years, research has been engrained in the fabric and the collective consciousness of universities. However, the drive for competition, the speed at which life evolves and economic survival have all contributed to the spread of research and knowledge generation beyond universities. The fact that research is also conducted outside universities has meant that universities have had their funding and support removed (in favour of competitors), and this has created tremendous change in the way in which institutions view research and how they respond to these pressures. Oakley (2001) states that globalization is fuelling the knowledge economy, and this has a major impact on the restructuring of academic institutions' identities and

> *". . . the 'ivory tower' is confronted by the reality of the 'global knowledge economy' manifested in the corporatization, privatization and commodification of academic life".*
>
> (Oakley, 2001, p. xiii)

These trends have a tremendous impact on academics' identities and the identities of academic disciplines (Henkel, 2000, p. 250-251). The state of academia reflects a market-driven economy which necessitates the primacy of economy over society. This phenomenon is labelled the 'metallic new entrepreneurialism' (Oakley, 2001, p. xiv). Nothing about universities, including the research function, is left untouched.

In contrast to the external environment, the internal environment of universities reflects the belief that research is its "supreme raison d'être – is universal science, unconnected to the trivial realities of the world of economics" (Braun & Merrien, 1999, p. 12), and that academic freedom is a "sacred value" which academics defend.

The organization of a university is therefore based on communities of academics that are "united in the same ideal" and the heads of the institution are "*primus inter pares*" [first among equals] (Braun & Merrien, 1999, pp. 12-13).

Herein lies the first tension in the research world view of universities – namely, the perceived disjunction between the internal institutional belief system and the needs of the external society it serves. The tremendous power that the external social actors exert over the functioning and management of universities is well documented (Schuller, 1996; Braun & Merrien, 1999; Smith & Langslow, 1999; Sporn, 1999; Henkel, 2000; Barnett, 2000). These forces impact greatly on universities' internal policy decisions and general management, and will be explored next.

2.1.3 CHANGES TO RESEARCH AT UNIVERSITIES

> *"Universities say that the biggest change in research activity in recent years is the conscious and active management of the research environment".*
>
> Sanders (2000, p. 3)

Within universities there are power play problems through two forms of agendas. The first has to do with academics and their need to research and teach in the purest form. The second revolves around the administration's desire for effectiveness and efficiency. External resource scarcity and competition amplifies this tension (Sporn, 1999, pp. 32-33).

Barnett (2000, p. 140) comments that research at universities is changing in three ways. This occurs firstly in a substantive manner – the knowledge that is sustained by a university has no particular status and takes its place amidst all the other producers of knowledge. Secondly, it occurs in an ideological manner – the knowledge of a university is lacking in legitimacy. It is to be understood by a set of privileged academics, thereby marginalizing the rest of society. And thirdly it occurs in a procedural manner – universities seem to be securing their place in the future by becoming more entrepreneurial and market-orientated. Universities have to obtain research grants and other forms of funding, and are thereby being forced to focus more on applied research, which the market actors require (Sporn, 1999, p. 18). Research, furthermore, has to be transformed into commercial products to increase the

institution's income capacity. These three changes result in universities becoming more sophisticated and specialized in their research efforts to address the issue of competition. This in turn leads to team-based research (largely due to cost savings and inter-disciplinarity) thereby resulting in fewer organizational units conducting research (Smith & Langslow, 1999, p. 144; Barnett, 2000, p. 141).

The cost of upkeep of library collections and other expensive research equipment influences scholarly activity, with a greater concentration of specialization in particular geographic regions – i.e. the concept of centres of excellence (Smith & Langslow, 1999, p. 144). Smith and Langslow argue that this might result in research being conducted away from universities. University–industry co-operation is prevalent in developed nations (Hellström & Husted, 2004, p. 165). Although this co-operation energizes research, it could at the same time serve to lure research away from higher education institutions. Universities might become 'centres of teaching', given the large demands placed on them by the massification of higher education.

The above changes to the research function at universities have an impact on the formulation of institutional research strategy. These external factors fall into three categories: political-economic, financial and institutional position (Hazelkorn, 2003b, p. 4).

Regarding the institution's position, up to this point I have described universities as institutions all with a common ideal – primarily to conduct research and also to teach. In reality each institution has a particular mission that provides its unique focus. As a result of the differences in institutional mission, categories of research intensity have emerged. Categories used to classify institutions during the United Kingdom's Research Assessment Exercises are: 'research-led', 'research-driven' and 'research-informed' (stated from most research-intensive to least research-intensive) (Ball & Butler, 2004, p. 90). It follows that institutions that fall within the 'research-informed' category might aspire to move into the 'research-driven' category and the 'research-driven' into the 'research-led' category. Institutions are therefore neither equal in their research missions nor in their intention to be 'research-led'.

To understand fully the complex effect that external pressures have on research at universities, the division of labour within a university is discussed next. This is done through a discussion of the definitions of research and knowledge production as well as a discussion of academic disciplines.

2.2 RESEARCH AND ACADEMIC DISCIPLINES

2.2.1 DEFINITIONS OF RESEARCH

The vehicle for formal knowledge production is research. Bushaway (2003, p. 142) defines research as:

> *". . . the process of undertaking or carrying out original investigation in all its forms: analysis, innovation, experiment, observation, intellectual inquiry, survey, scholarship, creativity, measurement, development, hypothesis, modelling and evaluating, with a view to generating new knowledge or novel comprehension".*

The South African national Department of Education (DoE) defines research as ". . . original, systematic investigation undertaken in order to gain new knowledge and understanding" (DoE, 2004, p. 1). Furthermore, there are also Frascati definitions of research (refer to table 2-1).

All of the above definitions of research explain the processes that are followed to generate knowledge at the level where research is physically conducted. Frascati definitions are delineated into four categories and incorporate the full Bushaway and DoE definitions.

Table 2-1: Frascati definitions from OECD (1992 cited in Bushaway, 2003, pp. 17-18)

Basic research	Original investigation with the primary aim of developing more complete knowledge or understanding of the subject(s) under study.
Fundamental research	Basic research carried out without working for long-term economic or social benefits other than the advancement of knowledge, and no positive efforts being made to apply the results to practical problems or to transfer the results to sector's responsible for their application.
Strategic research	Basic research carried out with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognized current or future practical problems.
Applied research	Original investigation undertaken in order to acquire new knowledge, and directed primarily towards specific practical aims or objectives such as determining possible uses for findings of basic research or solving already recognized problems.

Gibbons *et al.,* (1995, pp. 2-6) provide a variation on the Frascati and Bushaway definitions. The Gibbons interpretation of knowledge generation cuts across the Frascati definitions with two modes of knowledge production. Knowledge production is explained in the context of academic disciplines. The first mode, referred to as Mode 1, is the initial, predominant form of knowledge production and is

> *". . . a form of knowledge production – a complex of ideas, methods, values, norms – that has grown up to control the diffusion of the Newtonian model and increasing number of fields of enquiry, and ensures its compliance with what is considered sound scientific practice".*
>
> (Gibbons *et al.,* 1995, p. 2)

Mode 1 is commonly taken to be synonymous with the most pervasive and elitist of notions of knowledge generation, namely 'pure science'. "Its cognitive and social norms determine what shall count as significant problems, who shall be allowed to practice science and what constitutes good science" (Gibbons *et al.,* 1995, p. 3). Mode 1 is generated within a specific academic discipline and it is characterized by homogeneity. The practice of Mode 1 knowledge generation occurs in an organizationally hierarchical manner, e.g. the natural sciences tend to preserve their

form, do not interface with other disciplines in research matters and have their own rules and criteria for research quality control.

Mode 2 knowledge is generated in "...broader transdisciplinary, social and economic context" (Gibbons *et al.,* 1995, p. 3). Mode 2 is heterogenic, organizationally it is more heterarchical than transient and the research quality control is different from that of Mode 1. In Mode 2, qualitative and quantitative research co-exist side by side. Mode 2 is

> *"...more socially accountable and reflexive, it uses a wider, more temporary and heterogeneous set of practitioners, collaborating on a problem defined in a specific and localized context"*
>
> (Gibbons *et al.,* 1995, p. 3).

Mode 2 knowledge is "produced in the context of application" and has a broader-based system of quality control (Becher & Trowler, 2001, p. 7). South African universities are beginning to accommodate the notion of Mode 2 knowledge production, although it is unevenly disseminated within the national context (Jansen, 2002, p. 514).

Interdisciplinary research, as articulated in Mode 2, is defined by Jantsch (OECD, 1972 cited in McNeill, 1999, p. 314) according to the level of ambition of integration. These definitions are provided in table 2-2.

Table 2-2: Research integration levels (Jantsch 1972 in McNeill, 1999, p. 314)

Level 1: Multidisciplinary – there is autonomy in the different disciplines that will not lead to changes in the existing disciplinary or theoretical structures;
Level 2: Inter-disciplinary – there is co-operation between the disciplines to formulate a uniform, discipline-centred terminology or common methodology;
Level 3: Trans-disciplinary (also referred to as cross-disciplinary) – "research based on a common theoretical understanding and accompanied by mutual interpenetration of disciplinary epistemologies".

Definitions of disciplinary integration, provided in table 2-2, can also be summarized as follows (adapted from Karlqvist, 1999, p. 381):

- Doing the same thing in different ways (multi-disciplinary);
- Doing different things that can be combined (multi-disciplinary);
- Doing different things that cannot be combined unless there is an additional framework (inter-disciplinary); and
- Doing things differently and thinking differently (trans-disciplinary).

On the basis of the above, research is described according to the processes of knowledge generation, the aim with which knowledge is generated, the application level of knowledge produced and the rules of quality according to which knowledge is judged. These vary according to national imperatives, organizational settings and subject disciplines. Becher and Trowler (2001, p. 36) provide a matrix with types of subject disciplines, delineated according to pure and applied sciences (table 2-3).

Table 2-3: Knowledge and disciplinary grouping (Becher & Trowler, 2001)

Pure Sciences (e.g. Physics) 'hard-pure'	Cumulative; atomistic; concerned with universals; quantities and simplification; impersonal and value-free; clear criteria for knowledge verification; consensus over significant questions to address; results in discovery/explanation.
Humanities (e.g. History) and pure social sciences (e.g. anthropology) 'soft-pure'	Reiterative, holistic (organic / river-like); concerned with particulars; qualities, complication; personal and value-laden; dispute over criteria for knowledge verification and obsolescence; lack of consensus over significant questions to address; results in understanding / interpretation.
Technologies (e.g. mechanical engineering, clinical medicine) 'hard-applied'	Purposive; pragmatic (know-how via hard knowledge); concerned with mastery of the physical environment; applied heuristic approaches; uses both qualitative and quantitative approaches; criteria for judgement are purposive, functional; results in products / techniques.
Applied social science (e.g. education law, social administration) 'soft-applied'	Functional; utilitarian (know-how via soft knowledge); concerned with enhancement of [semi-]professional practice; uses case studies and case law to a large extent; results in protocols / procedures.

Becher and Trowler (2001) use a reductionist approach of 'hard' as opposed to 'soft' sciences, and 'pure' as opposed to 'applied' sciences to form a matrix to delineate

academic disciplines. Each of these disciplines conducts research in its own area based on accepted methodologies and ways of working – i.e. in groups, individually, rules of quality, etc. The differences between knowledge generation in the various academic disciplines is further sharpened by a system of peer-review in which reputations are generated and identities reinforced (Henkel, 2000, p. 258). The difference in opinions between academic disciplines regarding 'good' research and the opportunity for collaboration between disciplines, i.e. interdisciplinary or multidisciplinary research, does not therefore frequently occur spontaneously.

The formation and functioning of academic departments further deepen knowledge categories (Gumport & Snydman, 2002, p. 379). The organizational structure of an academic department provides a location for academics associated with the discipline and serves as a context for the discipline's norms. Disciplinary norms are further strengthened by the hiring of academics who are proficient in the norms, educate students according to the norms and thereby "shape the landscape of 'what is thinkable'..." in disciplinary terms (Swindler & Arditi, 1994, pp. 314-315 cited in Gumport & Snydman, 2002, p. 379). This implies that disciplinary differences, in essence, are socially constructed (Trowler, 1997, p. 309).

Mode 2 research implies the integration of disciplines as a result of the nature of problems and the nature of breakthroughs (Hansson, 1999, p. 339). Real-life problems require integrated solutions to "address problems that extend beyond the scope of traditional knowledge fields" (Frost *et al.,* (2004, p. 462). The nature of breakthroughs, on the other hand, argues that most breakthroughs with long-lasting impact have been as a result of the mixing of disciplines in achieving the solution. Disciplinary integration initiatives, according to Frost *et al.,* (2004, p. 467), are more successful when academics guide management structures, rather than the other way around. Management is not a success factor for disciplinary co-operation. Therefore, for collaboration between disciplines to be successful, role-players should understand their discipline's unique contribution to the overall collaboration and have an understanding of the approaches of other disciplines (Hansson, 1999, p. 341). Another prerequisite for disciplinary integration is the readiness of partners to engage in new forms of knowledge production (Jansen, 2002, p. 518).

Section one focused on the context of the research function within universities. Higher education institutions are increasingly changing the way in which they conduct and manage research in response to external pressures. In section two, the dissimilarity between academic disciplines and their unique research conventions internal to institutions was explained. Authors are increasingly indicating that knowledge is being produced in more fluid and collaborative ways. The first two sections provided background to understanding the complexities of research within universities. The next section will describe universities as institutions in which various academic disciplines are housed. Research management in such multifaceted institutions is therefore organized differently from that in business organizations.

2.3 UNIVERSITY RESEARCH ENVIRONMENT

2.3.1 THE UNIVERSITY RESEARCH ENVIRONMENT

Given the pressures, internal and external to universities, as well as the fundamental differences between academic subject disciplines, a university as an organizational form still remains a single integrated legal entity. The South African government distributes its research subsidy to the legal entity of the university. The only other forms of research funding that are distributed directly to specific academic disciplines are from the National Research Foundation (NRF) and industry. Even when funds are allocated directly to academic disciplines, such as is the case with the NRF, the funding bodies still take into consideration the combined amount of research funds that they allocate to different institutions. This is done to ensure fair and equitable allocation of research grants. So, predominantly with regard to grants and subsidy, the integrated legal entity, namely the institution, is important when considering research.

> *"Research agendas were no longer entirely a matter for individuals striving to achieve within the invisible college of the discipline. To some extent, they have become a collective matter and one that could be advantaged through formal structures".*
>
> Henkel (1999, p. 116)

Henkel (1999) makes a case for the importance of enhancing an institutional entity's research (or knowledge production) function, overall. In this regard an institution's research environment is important to understand. A research environment is defined as the total research system *over which an institution has control.* Although there could be elements of the external environment that a university can manipulate, an institution predominantly has the ability to control its internal environment. Where multiple institutions collaborate on research matters with each other, an internal environment also includes the research system between the institutions.

In order to optimize the research environment of a university, or multiple institutions, management of research has to take place. Broadly stated, the creation of enabling environments through research management necessitates clear vision and mission statements, consistent commitment of leadership, effective and efficient infrastructure and policies as well as a receptive external environment (Owen, 2002, p. 30). Bland and Ruffin (1992) conducted an intensive literature study of the factors that contribute to a productive research environment in the natural sciences. These factors are provided in table 2-4.

Table 2-4: Factors that support a research environment (Bland & Ruffin, 1992, pp. 388-393)

- clear goals that serve a coordinating function;
- research emphasis;
- a distinctive culture;
- a positive group climate;
- assertive participative governance;
- a decentralized organization;
- frequent communication;
- accessible resources (particularly human);
- sufficient size, age and diversity of the research group;
- appropriate rewards;
- concentration on recruitment and selection;
- leadership with research expertise and skill, both in initiating appropriate organizational structure and following characteristics of a productive research environment; and
- the utilization of participatory management practices.

The Bland and Ruffin study focused on the individual researcher and research group level. The characteristics identified in their study that support a research environment have a strong human resource management undertone. At national level within the primary healthcare network in the UK, Shaw *et al.,* (2004, pp. 95-97) identified motivating factors for primary healthcare organizations (PCOs) to act as hosts for

shared research governance systems with other PCOs. The findings of the study indicate that motivators for research collaboration between institutions included a strong desire to raise the profile of the PCO; the commitment of key individuals and leadership to research; a critical mass of research activity, strategic partnerships to share scarce skills and resources; mainstreaming research through effective communication and an emphasis on research; the effective management of relationships; and the effective use of existing systems and expertise. The study indicated that there did not appear to be any link between organizational structure models and motivating factors. However, the findings did highlight a concern about the bureaucratization of research with increased administrative burdens that could stifle the very activity that they intend to nurture.

Both the Shaw as well as Bland and Ruffin studies indicate factors that could seemingly be created through effective management practices but both also indicate less tangible factors such as commitment, a research culture and effective management of relationships. The complexity of research management is therefore illustrated in the factors derived from both studies. A discussion of research management follows.

2.3.2 RESEARCH MANAGEMENT

Research and knowledge management has in recent years become a highly professional and strategic function within universities. Bushaway (2003, p. 142) defines **institutional research management** as

> *"The duties and responsibilities commensurate with the successful implementation of the research strategy and its daily operational implications, the control and co-ordination of specific research projects, their quality and related tasks of sponsor management."*

Di Sarli (2002, pp. 18-19) describes research management as:

> *"Planning the physical and material conditions under which research may flourish; improving the dissemination of results; and activity comprehensive [sic] reporting".*

Both the Bushaway and Di Sarli definitions focus on standard management tasks such as planning, leading, organizing and controlling, within a research context. Research management, in its various forms and roles, is based on the tasks of **management** applied within the context of research.

University management, also called 'academic management' is of paramount importance to the efficiency and effectiveness of African universities (Teferra & Altbach, 2004, p. 31). Therefore, academic management has become professional, and deals with resources and resource relations (Gumport, 2000, p. 76). However, when academic management only deals with resources and their manipulation through ratios, planning, execution and control – the scientific management paradigm as espoused by Frederick Taylor (Richardson, 1995, p. 43) – it attracts justifiable opposition and critique. Academic management in the Taylorist tradition is also referred to as managerialism. When resources and resource manipulation are combined with the management of relations, including the management of human relations, management becomes a supporting and integrative function in a university. Research management, therefore, cannot occur professionally without individuals being trained in management (Braddock & Neave, 2002, p. 318). The management training should, however, also include the non-mechanistic elements of management, such as human relations, competitiveness, sustainability and networking. Research management in this sense becomes another professional stratum within university management (Neave, 2002, p. 218).

Knowledge management is similar to research management in that both focus on the full knowledge production, storage and knowledge dissemination processes. The difference lies in goal dissimilarities. Knowledge management's goal is to use knowledge to enhance organizational performance (Bassie, 1997, p. 5; Mayo, 1998, p. 35; Martinez, 1998, p. 89 cited in Bennett & Gabriel, 1999, p. 213). Knowledge management is used to inform organizational processes and products as well as organizational decisions (Yahya & Goh, 2002, p. 458). It therefore serves the internal organizational constituents' need to make the organization more effective. In an HE context, research management's goal is to optimize the research income potential of a university by increasing research productivity and to ensure that the research

produced by the institution is of relevance and value to its external constituents. Research productivity is explained next.

2.3.3 RESEARCH PRODUCTIVITY

The overall aim of research management is to increase the research productivity and research quality of an institution. Publication productivity, as a consequence of its measurability (namely, number of publications), is usually used as an indicator of research productivity. Publication productivity is not strictly equal to research productivity (Fox, 1992, p. 103). The reason is that there is no guarantee that large numbers of publications make for significant, quality contributions. An all-inclusive equation to calculate research productivity in this broad sense is not available. For the purposes of this study, publication productivity is used as an indicator of research productivity and is measured as self-reported number of publications published over a three-year period. According to the South African government's research funding framework, research output is defined as 'textual output'. Of the 'textual output' there are three publication output types that are formally recognized: journals, books and proceedings (DoE, 2004, p. 2). The funding framework incentivizes the delivery of postgraduate students (master's and doctoral), which makes this research activity part of the formally recognized research output. The narrow definition of output by the South African Department of Education, with the exception of the delivery of postgraduate students, is not flexible enough to support varying output types across academic disciplines. Marsicano *et al.,* (1999, p. 132) state that typical research activities at departmental level are: books, patents, research student supervision, conference participation, editorship of books, seminars and addresses delivered, research administration for national research foundation(s), refereeing articles for journals, editorial work for journals, publications in accredited peer review journals, published refereed conference proceedings and publication in other popular publications. All of the research activities form a network of support for a productive research culture but not all are directly financially supported by governments.

2.3.4 RESEARCH REGARDING RESEARCH PRODUCTIVITY

Research regarding research productivity is predominantly delineated into two main groups – namely, single-nation and cross-national studies (Teodorescu, 2000, pp. 203-

206). Of these two groups of studies, the majority refer to research productivity but most are more descriptive than quantitative in nature.

Single-nation studies are usually based on single disciplines and single institutional settings. Single-nation studies cover psychological-individual factors attributable to researchers, and include studies in the USA, UK and Australia. Other single-nation studies cover the Matthew-effect with reinforcement, and disciplinary norms (Wanner, Lewis & Gregorio 1981; Finkelstein 1984; Fox 1985; Cresswell 1985; Waworuntu 1986; McGee & Ford 1987; cited in Theodoresu, 2000, p. 204). Psychological-individual factors maintain that intrinsic rewards are more motivating than institutional incentive structures (Teodorescu, 2000, p. 204). The Matthew-effect and reinforcement postulates that researchers that have early success in their career are able to accumulate greater research funding and other forms of support based on their reputation over time than those who do not have a well-established research reputation (Teodorescu, 2000, p. 204). This effect is also referred to as the accumulative advantage. Disciplinary norms indicate that each discipline has different measures and mechanisms to support research productivity. Overall, the studies indicate that, at an individual level, individual characteristics are more important in predicting research productivity than institutional factors (Theodoresu, 2000, p. 204).

Another angle of investigating research at universities is exemplified by the single-nation multi-institutional study by Long and McGinnis (1981, cited in Fox, 1992, p. 105). The study investigated the effect of the prestige of organizational setting on publication productivity. Organizational settings were classified into research universities, non-research universities, non-academic and industrial settings. It was found that publication productivity was not a prerequisite to gain employment at any of the organizational settings but that "... once on the job ... publication comes to conform to the context ... after three years in the location" (Fox, 1992, p. 105). This means that the institutional prestige was reinforced through the organizational climate and norms at research universities. Publication productivity at these institutions is increased through the organizational climate and the pressure that this climate exerts on individual researchers to publish.

Other single-nation studies focused on university and industry collaboration (Landry *et al.,* 1996) and university and industry collaboration through entrepreneurial activity (Van Looy *et al.,* 2004). Landry *et al.,* (1996, p. 283) indicate that collaboration, whether internally between disciplines within a university, or externally between a university and industry or a university with another university, increases research productivity. Their study focused on applied engineering and associated disciplines and found that university and industry collaboration had significantly more impact on research productivity than did inter-university and intra-university collaboration between researchers. Van Looy *et al.,* (2004, p. 425) investigated the interaction between entrepreneurial activity and scientific performance in academia at a Belgian university, as measured by publication productivity. Their findings suggest that the activities do not impede each other and that entrepreneurial activity leads to increased publication output, without affecting the nature of publication quality. The study furthermore indicated that increased resources, together with entrepreneurial collaboration externally, lead to sharper increases in publication productivity than in university settings alone (Van Looy *et al.,* (2004, p. 433). These two studies support the notion that university and industry collaboration increases publication productivity.

Cross-national studies, according to Teodorescu (2000, p. 204-206), show that academics who stress a primary commitment to research publish more than those who stress teaching (Altbach & Lewis 1996, cited in Teodorescu, 2000). This study also indicated a high level of correlation between internationalism and research productivity. The research and teaching nexus was strongly supported by Gottlieb and Keith (1997, cited in Teodorescu, 2000, p. 205).

The Teodorescu (2000) study, which used the Carnegie Foundation's 'International Survey of the Academic Profession' questionnaire, analyzed data from 10 countries – namely, Australia, Brazil, Chile, Hong Kong, Israel, Japan, Korea, Mexico, the UK and the USA. The study was based on three parcels of variables that were linked to the dependent variable of research productivity as illustrated in figure 2-1.

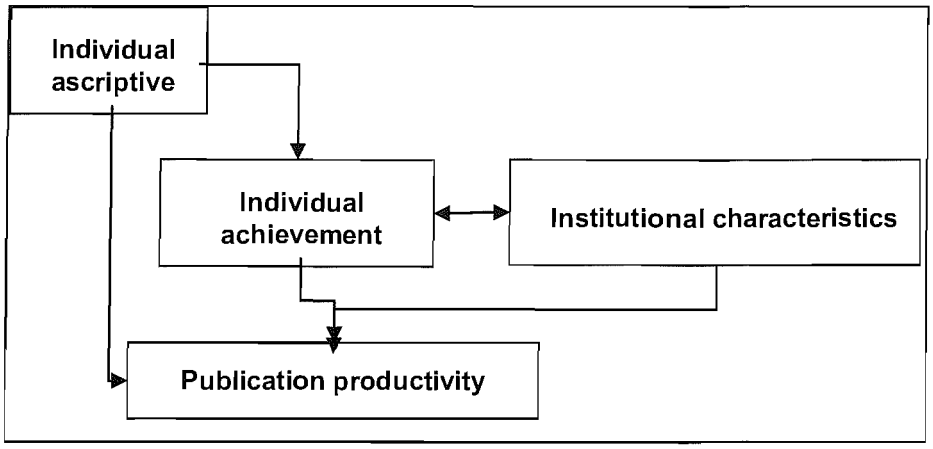


Figure 2-1: Model of publication productivity, Teodorescu (2000).

The study indicated that publication productivity predictors differed between nations and especially between developed and developing nations (Teodorescu, 2000, pp. 213-216). Age and gender, the *individual ascriptive* variables, did not predict research output. The *individual achievement* variables indicated that a strong affiliation with the subject discipline – i.e. membership of societies, academic rank, as well as access to professional international networks, was a very strong indicator of research output overall. Access to international networks, through the attendance of international conferences, was a very strong indicator of publication productivity in Brazil, Israel, Korea and Mexico. This suggests that, for developing nations, due to their poor national research dissemination mechanisms and systems, international networking and dissemination is of prime importance in motivating publication productivity. *Institutional characteristics* did not seem to influence research productivity in the ten countries studied. The only institutional characteristic that was significant for Australia, Japan, the UK and the USA, was time spent on research. In the other six countries studied, time spent on research did not increase the prediction for publication productivity. The question arises whether research management, which would traditionally manipulate institutional characteristics, has any impact on research productivity at all.

In contrast to the Teodorescu (2000) study, Wissing, Du Toit and Rothmann (2002, p. 92) state that the research productivity of academics at South African historically advantaged universities is influenced by time and work overload, a lack of support from the institution, role overload with conflicting expectations and the conflict between teaching, research and service delivery. The need for academics to

supplement their income externally is also cited as a fundamental strain on time available for research. Researchers at the lower levels of the hierarchy are furthermore hampered by a lack of mentorship and research skills and, most importantly, South African academics are not convinced that increased research output will lead to desired outcomes such as recognition and support (Wissing *et al.,* 2002, p. 95). The South African-based study therefore posits that institutional characteristics are a strong influence on research productivity. It could be that the South African context is influenced more by institutional characteristics than other contexts as a result of the country's unique HE history and the associated consequences of teaching massification and poorly prepared students. Whatever the reasons for the differences, the Teodorescu (2000) and Wissing *et al.,* (2002) studies clearly indicate that the factors motivating publication productivity differ markedly across national academic settings.

Publication productivity is therefore one of the most prevalent indicators of research productivity. Other indicators could be the number and size of research grants and contracts and other forms of peer recognition. Now that other studies on publication productivity and the definition of publication productivity have been explained, research management is explored further.

2.3.5 LEVELS OF RESEARCH MANAGEMENT

Bushaway (2003, p. 142) indicates that there are additional research roles, other than the one generic research management role, within a university. These are leadership, co-ordination, planning and support (table 2-5).

Table 2-5: Research management roles (Bushaway, 2003, p. 142)

RESEARCH LEADERSHIP	"Is the role of directing research, deciding upon its course, organising tasks and priorities, setting goals and targets, identifying commercial potential, championing the research group or team, communicating findings, developing strategy and establishing requisite research infrastructure and environment, managing and deploying resources, identifying opportunities and setting up links, collaborations and partnerships, operating the networks necessary for the continuation of the research area and the success of is projects and programmes".

RESEARCH CO-ORDINATION	"The process of balancing resources and matching them to priorities, projects, and programmes which might involve accountability and responsibility for these resources at particular level in the university".
RESEARCH PLANNING	"The process of formulating a research strategy of ensuring that specific local research strategies are formulated and integrated in accordance with the aims and objectives of the university's overall research strategy taking account of available resources, aspirations, missions and targets".
RESEARCH SUPPORT	"The tasks of enabling, facilitating and nurturing research, unusually from a corporate perspective and, in particular, financial and human resources management, research information management, advice and guidance on research and funding opportunities, networking and co-ordination of policy and procedures and strategy-setting, as well as supporting the commercialisation and exploitation of research results in the form of intellectual property".

The various roles defined in table 2-5 give rise to the concept that there are various levels at which research is managed within an institution. These levels have been described as both external and internal (Di Sarli, 2002, pp. 10-11). The external levels are national and regional and the internal levels are the institutional (macro) and academic unit (micro) levels. At the internal macro level there is portfolio management, and quality as well as performance management (Ball & Butler, 2004, p. 87). Project management features at the internal micro level (Ball & Butler, 2004, p. 87). I have compared Bushaway's delineation of research levels for the United Kingdom with Di Sarli's representation of research levels in Europe, and included references from Hazelkorn (2003b) in table 2-6, where applicable.

Table 2-6: Research management policy levels

Levels	Di Sarli (2002) for Europe	Bushaway (2003) for the United Kingdom
AT NATIONAL / GOVERNMENTAL LEVEL (External)	Setting national research priorities. Selectivity procedures, concentration schemes, designation of centres of excellence, promotion of networks. Funding mechanism to steer research activity, postgraduate courses and university-enterprise links. National agencies to set policies and promote links to industry. Social accountability procedures to stimulate research.	None provided.
AT REGIONAL/ PROVINCIAL LEVEL (External)	A definition of needs for social development. Promotion of links with the economic environment, local authorities and industries. Promotion of research activity in order to attract local funding.	None provided.

AT INSTITUTIONAL / UNIVERSITY LEVEL (Internal macro)	Overall institutional level – no delineation within the institution: Clear definition of the mission of the university. Definition of priorities in research fields. Definition of policies to balance fundamental and applied research. Definition of policies to support local development. Definition of policies of social accountability and operational transparency in the use of public and private funding.	Delineation within the institution: VICE CHANCELLOR AND CORPORATE MANAGEMENT TEAM: Corporate research mission. (Hazelkorn, 2003b, p. 4) Corporate research strategy. Corporate research support services. Corporate research policies. Statutory requirements compliance. Resource allocation for research (Hazelkorn, 2003b, p. 4). Promotions, publicity and marketing of research. Capital investment programme in research facilities. Corporate sponsors and 'friend-raining'. Information and communications technology infrastructure. Business intelligence Needs of market awareness. Partnership/alliance building. Research profile, which includes the research-teaching nexus, research status as well as relationships with industry (Hazelkorn, 2003b, p. 4)

Levels	Di Sarli (2002) for Europe	Bushaway (2003) for the United Kingdom
SCHOOL OR DEPARTMENT LEVEL (Internal micro)	None provided.	SCHOOL OR DEPARTMENT LEVEL: Unit research strategy Research facilities, procurement, management and maintenance. Resources allocation within unit and operational guidance. Research quality management policies. Research support (peer review, proposal approval, etc.). Research environment (seminar programme, post graduate programme, travel and conferences support, research culture). Infrastructure for research and partnerships. Research priorities. Promotion and marketing. Business intelligence. Partnership / alliance building.

From table 2-6 it is evident that research management does not occur in a vacuum and that systemic interfaces between levels are necessary to enhance an institution's research environment (Shattock, 2003, p. 112). Mouton (2000, cited in Mashego, 2000, p. 5) states that in South African universities there are three research levels: the levels of the individual researcher(s); research programmes and projects; and the institution. At each of these levels, clear areas of responsibility should exist so that effective research management can occur. It has been said that the centre of gravity of research-led universities is at the academic discipline level. Positive change, e.g. in

the cultivation of research, can occur when the focus of leadership is at the 'level of the natural activity system of universities' namely the departmental level (Knight & Trowler, 2000, p. 78).

But research management functions within and influences the way in which universities are structured. The internal organization of universities is discussed next.

2.3.6 ORGANIZING A UNIVERSITY

Various studies have been conducted on the research function and structural / organizational issues (Clark 1983; Ben-David 1971, 1979, cited in Teodorescu, 2000, p. 205; Sporn, 1999). Depending on the focus, namely structure and authority, there are four approaches to organizing an academic institution (Sporn, 1999, p. 36): the collegial model (Birnbaum, 1989, cited in Sporn, 1999), the bureaucratic model (Birnbaum, 1989 cited in Sporn, 1999), the political model, where power and interest groups are represented (Baldridge, 1971 cited in Sporn 1999), and, finally, loosely coupled systems where elements, connections and environments are described (Weick, 1976, cited in Sporn, 1999).

From the four approaches to academic organization, four typical cultures in higher education emerge, i.e. collegium, bureaucracy, corporation and enterprise (Braun & Merrien, 1999, pp. 44-46). All four types of cultures co-exist in most universities, but with different balances amongst them. These differences depend on a range of factors including traditions, mission, leadership style and external pressures. Figure 2-2 is an illustration of the cultural types.

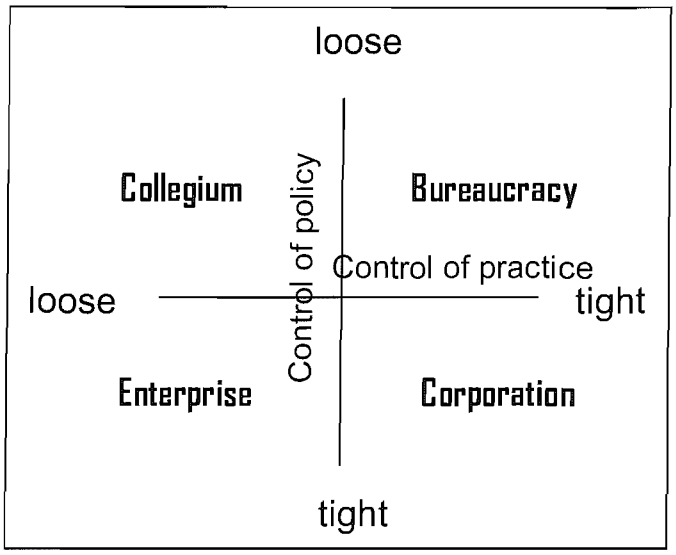


Figure 2-2: University culture types (McNay, 1996)

The *collegium* is a set of loosely coupled systems (if any) with a consensus-based management style. Academic disciplines are most important, with peer review as the mechanism of control. The dominant unit is the academic department or the individual academic. Collegiums seek institutional freedom from external controls, now mainly by government and internal management, and academic autonomy (Braun & Merrien, 1999, pp. 46-47; McNay, 1996, p. 109).

In the *bureaucracy*, regulation becomes important. The management style is formal and rational in nature. Faculty units as well as committees are the dominant units. The main aim of a bureaucracy is to ensure equity in the development and application of policies and procedures. A bureaucracy standardizes procedures and decisions and remains stable, with long cycles of decision-making (Braun & Merrien, 1999, p. 48-49; McNay, 1996, p. 109).

In the *corporation* the executive team asserts authority, with the Principal/Rector as 'chief executive'. It is also referred to as the 'command and control model' and loyalty to the executive team is enforced through power. People are treated as production resources and committees disempowered through the appointment (rather than the election) of members. The management style is therefore political and tactical in nature. Strategic management and associated strategic plans are used as the basis for all decisions (Braun & Merrien, 1999, pp. 49-52; McNay, 1996, p. 109).

In the *enterprise*, the key concept is the 'client'. The market plays an important role and students are therefore seen as clients and the institution is there to bring together the expertise of academics in order to serve the client. The management style is that of devolved leadership, where decisions are based on client considerations. This culture could conflict with the needs of the academic discipline when sole consideration is given to the whims of the market. In the enterprise culture there is specialization of all types of services, not only that of the academic cadre. These specialist units are close to the client (internally and externally) and work according to service delivery standards. There is strong corporate identity (the institution) with expert support units that drive the entrepreneurial organization (Braun & Merrien, 1999, pp. 52-54; McNay, 1996, p. 109).

2.3.7 MINTZBERG'S MODEL OF ORGANIZATIONAL STRUCTURES

The above four approaches to organizing academia and their resultant cultures can best be summarized by the five organizational pulls in the design of an organizational structure, as presented by Mintzberg (1983, pp. 153-156). These pull factors culminate in five organizational constellations as illustrated in figure 2-3.

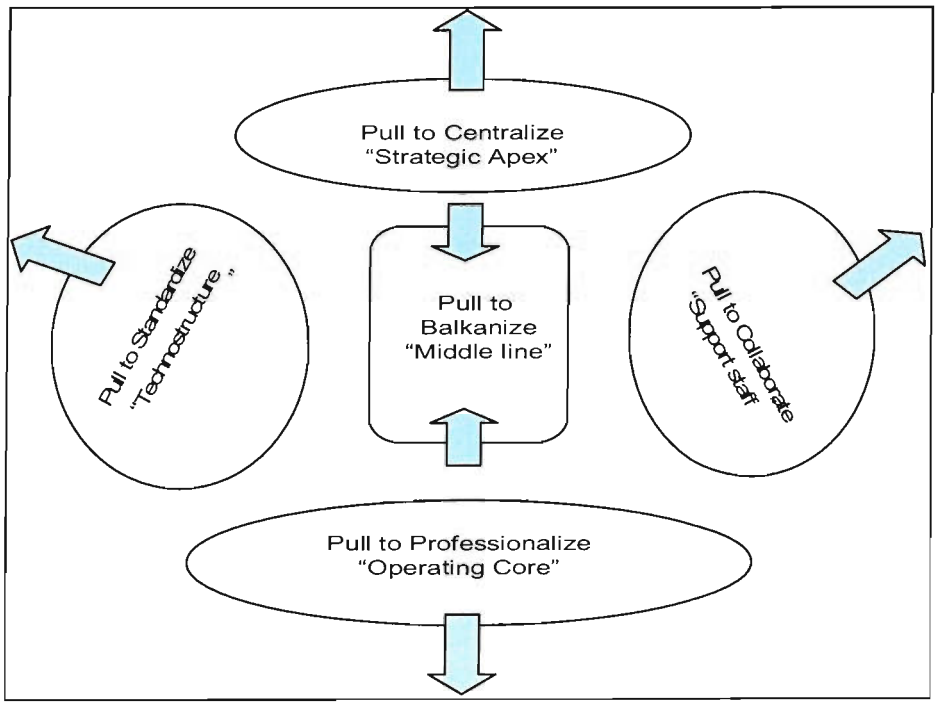


Figure 2-3: Five pulls on the organization (adapted from Mintzberg, 1983, p. 154)

Starting at the bottom of figure 2-3, the **operating core**, namely the academics/researchers, aim to pull power and decision-making towards them, thereby ensuring, freedom from external controls, academic subject autonomy and *collegial* interaction. Skill sets are standardized, i.e. teaching and research, although they are applied within different academic disciplines, and Mintzberg (1983, p. 153) refers to a *professional bureaucracy* that develops. The operating core is delineated into academic disciplines either through the history of the discipline, the culture of the discipline, or explicit managerial intervention to direct disciplinary integration e.g. the formation of a School (Tight, 2003, pp. 407-408).

Mintzberg's **technostructure** (to the left in figure 2-3) is typically where work processes are standardized through policy instruments. The technostructure aims to pull for 'limited horizontal decentralization' into a state of *bureaucracy*. Units that fall into a technostructure aim for equity across work processes and want to direct the work of the operating core, the support staff (if they exist within an organization) as well as the middle line.

Where there is a strong pull for the **strategic apex** to centralize power and decision-making, a culture of the *corporation* emerges. Mintzberg refers to a simple structure that emerges through direct supervision of the constellations below the strategic apex (Mintzberg, 1983, p. 153). Direct supervision illustrates that people are seen as production resources that have to be centrally controlled.

A culture of the *enterprise* emerges where the **middle line** as well as the **support staff** pull power towards themselves. Support staff are specialized units of expertise that support the operations of the operating core in particular, but also the middle line as well as the technostructure. The middle line organizes itself according to market-based units – also referred to as divisionalized form (Mintzberg, 1983, p. 153). In a university structure these units are usually Faculties or Schools. A balkanized structure emerges, which can be tempered by the support staff's pull towards selective decentralization of their expert support. This pull is referred to as an adhocracy (Mintzberg, 1983, p. 153) and the support staff become powerful when their expertise is called for during decision-making. Support staff adapt their decisions according to

those whom they provide support to. These 'clients' of the support staff can be found in the other constellations in figure 2-3.

The organizational structure and resulting culture of universities is therefore moulded according to the strongest pulls for decision-making power. The five organizational constellations of Mintzberg provide a context in which the functions and levels of research management can be placed, depending on the culture the institution wishes to foster. It is important not to lose focus of the overall aim of research management, namely to increase the research productivity and research quality of an institution. The strongest pull for power should therefore be commensurate with the overall aim. Typologies of research management structures, committee and unit structures are discussed next.

2.3.8 DESIGNING AN APPROPRIATE RESEARCH MANAGEMENT STRUCTURE

> *"The challenge within institutions is not just to be alert to a changing policy environment and to foster a strong research climate. It is to show a capability to design and operate new structures and processes for stimulating, guiding and managing research."*
>
> (Connell, 2004, p. 27)

The findings of Di Sarli (2002) regarding formal institutional research management structures, and Shamai and Kfir (2002) regarding research committee structures, can be placed within the Mintzberg model of five pulls. Di Sarli (2002, p. 15) suggests that the formal research management structure at institutional level should include:

1. A post at a high influence level with the responsibility of overall institutional management. This position entails the promotion of research e.g., Vice-rector for research *(Strategic apex)*.
2. A council or committee to draw up a policy or plan for research with a funds and staff allocation model *(Strategic apex)*.
3. A unit (or post) for the liaison task with local economic activities to establish needs for research and training *(Support services)*.

4. A technology transfer or innovation centre which is responsible for the university research strategy and pro-active research stimulation *(Support services)*.
5. An economic activity science park, zone or district, to assist in the development of local entrepreneurs and commercial exploitation of research and development activities of the university *(Support services)*.

In decentralized decision-making at institutions, many institutions make use of committees or units to manage research activities. Shamai and Kfir (2002, pp. 405-407) provide a classification of two streams of research management in table 2-7, namely types of research committees and types of research units (a central institutional research office). These are once again placed within the Mintzberg constellations.

Shamai and Kfir (2002) postulate that committee structures become more effective the higher up the typology list one moves. Therefore committees with characteristics similar to the higher levels, i.e. 'initiating research committee' and 'active prominent research unit', should be more effective in managing research.

Whether the research management structure within the overall university structure is built through committees and/or units, the characteristics of a university should remain the same – namely, that of a knowledge-creating organization.

Table 2-7: Committee structures, Shamai and Kfir (2002, p. 405-407)

Research committee classification types (Mintzberg's Middle line)	Research unit classification types (Mintzberg's Technostructure)
No research committee. Passive research committee – a committee that scarcely has resources with which to assist researchers. Supportive research committee – a committee that offers budgetary support, methodological guidance and support to publish findings Initiating research committee – This committee offers assistance as in the previous case, but also reaches out. It actively encourages researchers to apply for funding, initiates efforts for fundraising and offers further services such as guidance, data processing and edition, etc.	No functional research unit. Limited research unit – research exists, but is not actively encouraged. Insufficient funds and other resources. Medium research unit: Units control resources that make significant research possible. Unit meets ongoing research and evaluation needs of the college and issues periodic reports. There is a research culture in the institution but it is not the domain of the majority. Active prominent research unit: Substantial resources in terms of personnel positions and administrative assistance and budgets. Staff members of the unit have strong research skills. The prominence of research activity in the unit influences and promotes research throughout the institution. The scope and style of the research unit is highly influential but it does not have an exclusive role in moulding the institutional research culture.

2.3.9 CHARACTERISTICS OF KNOWLEDGE-CREATING ORGANIZATIONS

Knowledge organizations require a different management approach from that in non-knowledge-based organizations. This management approach is less directive and controlling (Yahya & Goh, 2002, p. 466). Highly directive and controlling management practices are synonymous with Taylorism. Knowledge organizations, such as universities, rely on decentralized structures and strong leadership at the dean level to sustain an environment that supports knowledge development (Pratt & Margaritis, 1999, p. 43).

Leadbeater (1999 cited in Evans, 2003, pp. 39-40), provides a set of characteristics for knowledge-creating organizations. A knowledge-creating organization is or has:

- *Cellular* – organizational structures that are adaptive. If structures are too rigidly defined there is not enough room to manoeuvre. If they are too loosely defined, there is no distinction to them.
- *Self-managing* – This ensures that innovation and creativity are unlocked. In order to self-manage there should be a free flow of information in all directions.
- *Entrepreneurial* – able to spot and act on opportunities as they arise.
- *Equitable membership and reward* – self-management can lead to disjuncture between ownership and membership of an organization. Self-management should be balanced with reward systems that create a sense of membership.
- *Deep knowledge reservoirs* – knowledge has to be viewed as a core capability of the organization, and specialist expertise instead of generalist knowledge has to be developed.
- *Holistic organization* – an organization that recognizes that there are networks outside of it from which it can benefit and be beneficial to.
- *Collaborative leadership* – the role of the centre is less concerned with monitoring and checking and more concerned with setting direction, communicating values, raising ambitions and encouraging others to adopt a networking approach.

Since universities are knowledge-creating organizations, the above characteristics point towards a collaborative culture that enhances the environment so that knowledge-creation can flourish. These characteristics should be kept in mind when research management practices are employed within an institution. Studies have indicated that research management and the associated levels at which it employs different roles and responsibilities according to the different configurations of organizational structure, and the resulting organizational cultures, have an influence on research productivity. Specific research management practices, the importance of which has been highlighted in the literature, are discussed next.

Section 4

2.4 RESEARCH MANAGEMENT PRACTICES

2.4.1 INSTITUTIONAL RESEARCH MANAGEMENT PRACTICES

In the previous sections I discussed the university research environment and explained what is meant by research management. In this section I will start by describing four types of research that are traditionally managed in a university. The rest of the section is based on research management practices and strategies to improve research productivity that are prevalent in the relevant literature. These practices centre on the topics of strategy, funding, focus/niche areas, ownership and performance management.

2.4.2 TYPES OF RESEARCH FROM A MANAGEMENT PERSPECTIVE

Bushaway (2003, pp. 39-108) proposes the following types of research to be managed by universities:

a. Postgraduate research: Where a qualification is associated with the research effort.
b. Grant-aided research: A sum of money that is provided to a university by government or a public body for a specific programme of research in a specific time frame. Usually awarded in response to application by the institution or individual according to the guidelines of the grant.
c. Contract research: A formal agreement between two or more parties to deliver research according to the stipulations of the contract usually specifies time frame, intellectual property rights, cost and payment terms. Undertaken with public and private bodies.
d. I have added another category of research, namely research conducted without grants or contracts and is not linked to the conferment of a qualification. This refers to research by a single researcher, or group of researchers, which will result in a recognized research output.

Naturally the above may be interwoven in many combinations – i.e. postgraduate research that is grant-aided and so forth. Underpinning all of these forms of research

are research management practices such as strategic planning, funding, focus areas and human resource management, which will be discussed next.

2.4.3 STRATEGIC PLANNING

Strategic planning plays an important role in the management of modern universities. Developing and implementing strategic plans is a critical component of successful research management (Drummond, 2003, p. 4). The philosophy that the institution ascribes to will influence the manner in which strategic planning is viewed and executed. Whittington (2001, pp. 9-40) delineated four strategic philosophies (as illustrated in figure 2-4). The philosophies differ according to variation in *processes* and *outcomes* of strategic planning.

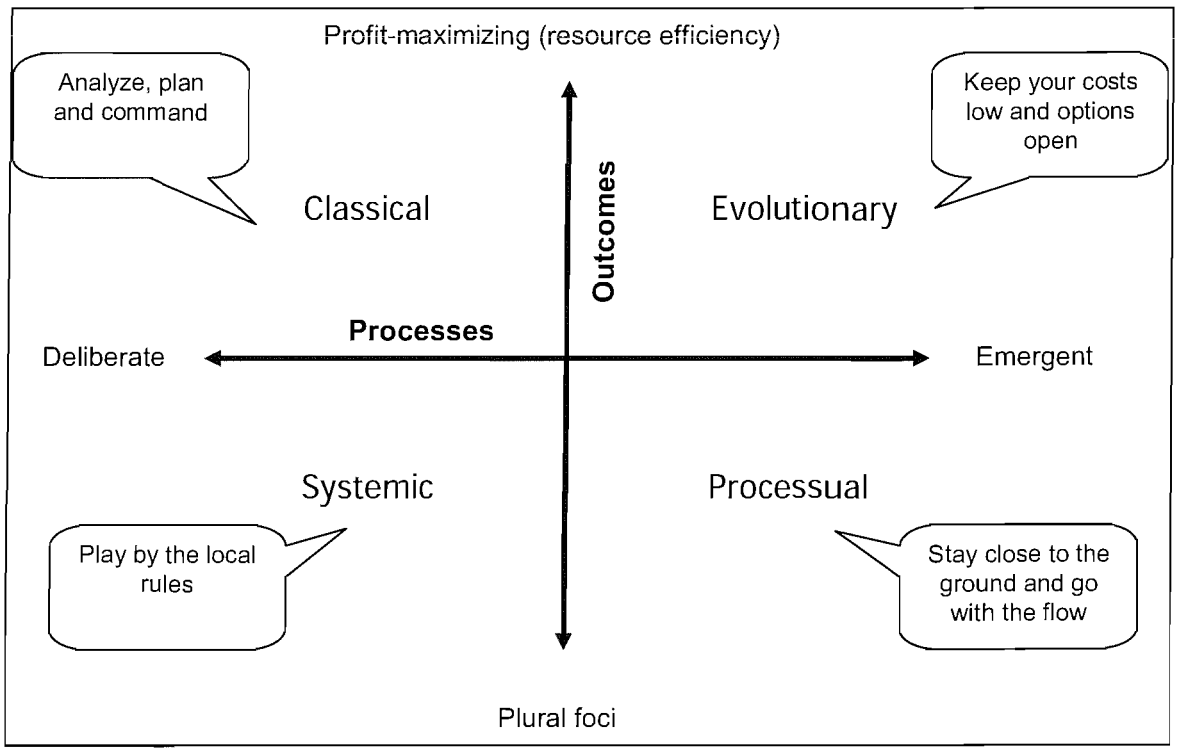


Figure 2-4: Strategic philosophy (Whittington, 2001, p. 10)

Organizations that follow the *classical* approach to strategic planning (an example is the Porter value chain) use deliberate processes focused on the maximization of profits. Strategic planning based on this philosophy is executed in the analyze, plan, command and control style. Organizations that seek to maximize profit and resource efficiency, but through emergent and non-directive processes, follow the *evolutionary* philosophy. Resource efficiency is still very important but planning is organic and

occurs as opportunities arise. The third philosophy is the *processual* philosophy. Organizations that adhere to this strategic planning philosophy keep their options open with respect to opportunities and therefore do not embark on formal strategic planning, especially not at the institutional level. These organizations, furthermore, do not seek profit maximization as their ultimate goal. The last philosophy Whittington outlines is the *systemic* approach to strategic planning. The organization once again does not have profit maximization as the ultimate goal, nor does it necessarily focus on efficient use of resources. It does, however, embark on deliberate strategic planning processes to enhance its chances of benefiting from the opportunities that exist in its environment.

The planning philosophy of an institution, or institutional units, should match the characteristics of the institutional culture, as described in the previous section (i.e. collegium, bureaucracy, enterprise and corporation). The ultimate aim of planning, and by implication of strategic planning, is to organize and align resources to a particular goal or multiple goals, thereby enhancing the probability of achieving them. Strategic planning for purposes of research management at the university level now shifts from the individual academic level to the research unit and institutional levels (Rowley, 1999, p. 208; Henkel, 1999, p. 116). The starting point of strategic planning is to determine whether an institution commits itself to active engagement in research at the institutional level at all, and which research goals it seeks to achieve. Patterson (2001, p. 159) cautions against the use of goal strategy (or classical and even evolutionary strategic planning) in universities, since universities are complex and extremely diverse in nature.

2.4.4 FUNDING

Developing countries are dominated by public universities that charge low tuition fees and are financially dependent on the State (Saleh, 2002, p. 237). Saleh indicates that this means that these institutions' income fluctuates with government resources – which complicates long-term research planning and capital investment. As a result of this acute dependency, governments demand greater financial accountability from institutions. One way of reducing the dependency is to solicit private funds for research – i.e. contract research. This in turn has major implications for the ownership of research. One might find that those who pay for research are also the owners of it.

Another manner in which to boost alternative funding sources is by increasing research grants. A key factor in attracting grants is the ability and reputation of the principal researcher (ACU, 2002, p. 5) and a researcher's ability to compile grant proposals (Boyer & Cockriel, 2001, p. 22). Many universities in South Africa also have commercial activities, usually unrelated to research, that subsidize the research efforts of the institutions.

Universities are furthermore embroiled in intense competition with other research organizations for research funds. Of importance for national science systems are the findings of national publication productivity – as Teodorescu's (1994) research indicates. This study shows that in nations where universities receive more funds than do other governmental research units, there is a markedly higher publication productivity from the university sector.

Internally at universities, critical funding concerns are the distribution and allocation of available research funds. Firstly, the decision has to be made as to whether available research funds are allocated to the best research units only, or whether they should be shared with the developing disciplines (Di Sarli, 2002, pp. 13-14). The political context of the institution determines whether it would lean towards one or the other. Politics through power play may also lead to the repression of academic disciplines that pose a threat to the status of already established disciplines (Viner *et al.,* 2004, p. 446). At researcher level the Matthew-effect (Merton, 1988, cited in Van Looy *et al.,* 2004, p. 439; Teodorescu, 2000, p. 204; Viner *et al.,* 2004, p. 444), deserves mention. Allocators of funds, especially in committee structures, should guard against an inherent bias towards prominent researchers.

Other internal funding issues include the model or formula employed to calculate and allocate costs of the research. Many universities do not have systems through which the true cost of research can be calculated, and this results in under-quoting and not recouping the cost of research. Interdisciplinary research further complicates the manner in which costs and income are allocated. Many research projects are not run on a project basis and therefore financial accounting is not easily conducted.

The cost of internationalization and the forming of partnerships across a country's borders are increasingly important factors in research excellence. The debate is deepened with questions about the relevance and importance of strategic international partners, and the cost of acquiring (or not acquiring) these partnerships.

In all of the funding decisions that governments and institutions have to make, as Pfeffer and Salancik (1979 cited in Viner *et al.,* 2004, p. 443) point out, a scarce resource such as funding, increases the effective power of those who control it. This power is handed from the government, grant agencies, or business organizations, to the 'successful' researchers.

Liefner (2003, p. 486) makes the contentious remark that:

> *"Universities with a large number of highly motivated and qualified faculty [staff] will be successful regardless of the form of resource allocation".*

Liefner's comparison of different resource allocation models in various universities and their effect on publication productivity shows that resource allocation cannot directly influence the long-term success of universities (Liefner, 2003, p. 486). Resource allocation can, however, force institutions to pay attention to the policy goals of governments, internally re-direct institutions' research goals and reallocate the budgets of non-performing disciplines to better-performing disciplines.

Whatever the intentions behind resource allocation decisions, the message they send to researchers in the institution is very powerful, thereby reinforcing or creating a specific research culture.

2.4.5 FOCUS/NICHE AREAS

Research focus areas are associated with fund allocation models. They form the basis on which these models operate and as such are highly contentious. Many institutions make use of focus areas to direct the allocation of scarce resources such as funding, even in instances where governments do not dictate focus areas. Hazelkorn (2003a, p. 13) uses terms such as 'targeted/niche' as opposed to 'seed-corn' or 'universal' to indicate the strategies that could be used to direct funding. Seed-corn approaches will

"... encourage as many [research areas as] possible to grow, including new research areas" and a universal approach does not reflect any particular research priority, instead providing funds for all who are interested in research.

Focus areas can also be viewed from a 'centre of excellence' perspective, where fund allocation is not the primary concern but where academic discipline focus areas are identified to support an institution's research strengths. In this sense, focus areas are used for resource allocation in its broadest context, which includes funding allocation.

2.4.6 OWNERSHIP

Contract research by its very nature creates the problematic issue of ownership. Contract research implies the demarcation of responsibilities with counter compensation. In the negotiation of these contracts, intellectual property and copyright issues feature prominently. The ownership of research data and results is a highly contentious issue as this can lead to various implications for long-term institutional research management. Ownership may steer a university into academic inquiry that it never wanted to enter (Slaughter & Leslie, 1997, cited in Powers, 2003, p. 27), and is even sometimes ethically compromising. When an institution receives funding for a particular research project, it is automatically open to exploitation by the owner of that research. Furthermore, knowledge in Mode 1 is no longer pursued with as much fervour as it would have been before external funding became such a lifeline for institutions. Mode 2 will be pursued for its income-generating potential more than Mode 1 research. The commercialization of research activities as a form of research dissemination and transfer also raises concerns similar to those associated with contract research.

2.4.7 PERFORMANCE MANAGEMENT

The management of outputs of academics and research groups can be facilitated through a mechanism called performance management. Performance management refers to the mutually agreed upon outputs (usually quantified) that are contracted between a researcher and his/her supervisor for a particular period of time – usually one year – and the processes used to ensure that those outputs are realized. Performance management is not necessarily linked to financial or other rewards. In its initial implementation, performance management should first be entrenched in the

normal functioning of a university before reward mechanisms are introduced. This ensures that people are first sensitized to the function and sanctions of the system and thereafter introduced to the complexity of rewarding excellent output.

Managing the research performance of researchers who have specialized knowledge not necessarily shared by managers is highly complex (Liefner, 2003, p. 478). Instead of linking rewards to performance outcomes, Liefner (2003, p. 479) makes a case for linking the allocation of research funds to previous performance outcomes. This ensures that high levels of research activity should occur to maintain the same levels of funding. The downside of this is that researchers choose projects that have a high probability of success since the performance management system does not reward failure. High-risk projects are therefore not attempted for fear of failure.

Liefner (2003, p. 486) furthermore found that well-qualified academics tend to respond less to monetary incentives. Instead he states that these individuals work according to their internal motivation and interests. This corresponds with Maslow's hierarchy of needs in which self-actualization becomes more important as basic needs are met (Gwynne, 1997). Other forms of rewards include recognition through internal and external publicity, as well as flexibility and freedom in setting up new research teams and projects (ACU, 2002, p. 7). Career advancement, which in the case of universities is usually closely associated with research performance (Roworth-Stokes, 2000, p. 141; Henkel, 2000, p. 208; Teodorescu, 2000, p. 201), is arguably the strongest reward that can be coupled to performance outcomes.

In summary, performance management can be a strong factor to support research productivity. Performance management and associated rewards and recognition should be geared towards the aims of the research system (Jansen, 2002, p. 516), or else academics will remain focused on those performance items that are being monitored instead of striving for the new.

The most prevalent research management practices, as found in the literature, have been discussed in this section. All of these practices take place within a university environment and, more specifically, are concerned with the work of academics. This is discussed next.

Section 5

2.5 ACADEMIC WORK CONDITIONS

Blaxter, Hughes and Tight (1998, p. 284) identified five roles that academics have to fulfil in executing their work. The roles are teaching, researching, managing, writing and networking. Writing and networking are specifically indicated as separate roles since through writing academics have to report and communicate on different aspects of their work, for formal and informal purposes. Networking, on the other hand, is a role that has grown in importance due to the myriad interactions that individuals and institutions have with each other. Through networking, personal and professional contacts are developed and used to maintain and further academic careers and projects (Blaxter *et al.,* 1998, p. 284). All of the roles that academics fulfil are increasingly being quantified into measurable units that can easily be monitored and manipulated through management practices.

The Carnegie Foundation for the Advancement of Teaching launched an international study into the academic profession between 1991 and 1993 (Whitelaw, 1994, p. 669). The study was conducted in Australia, Brazil, Chile, Egypt, England, [West] Germany, Hong Kong, Israel, Japan, [South] Korea, Mexico, the Netherlands, Russia, Sweden and the United States. In this study the work conditions of academic staff at universities were indicated as time commitments, salary and general conditions affecting the academic climate. Professional activity was defined as teaching, research and service. An adapted version of their questionnaire was used in the quantitative phase of my study. This facilitated understanding of the factors that have the highest prediction rate of publication productivity in the two institutions under study.

Although service is acknowledged as one of the professional activities of an academic, the primary activities in the academic work environment are teaching and research. The work conditions in this environment influence the attitudes, and by implication the outputs, of the academics. Winter and Sarros (2002, p. 242) identified factors that make the work environment in Australian academe motivating and Wissing *et al.,* conducted a similar study in South Africa (2002, p. 95). A motivating

environment leads to job involvement, organizational commitment and increased outputs. Motivating factors were: clear roles and challenging job tasks, group-based research, continuous uninterrupted time, research funds, high-quality postgraduate students, and supportive leadership. On the other hand, factors that impede a work environment were identified as job overload, role ambiguity, low participation in decision-making, lack of physical infrastructure, time spent on teaching and poor rewards and recognition. The South African study furthermore indicated that the time and energy spent on 'transformation' reduced research productivity.

The academic work environment can furthermore be explained by understanding the differences in the environment caused by institutional types.

2.5.1 INSTITUTIONAL-TYPE DIFFERENCES

Harman (2001, p. 325-342) conducted a study in Australia in which different institutional types were compared to determine differences in academic staff characteristics. This study is important for my own study since the two institutions under investigation in my study can be roughly compared to the pre- and post-1987 institutions in Australia. The university can be compared to the pre-1987 institutions and the technikon to the post-1987 institutions. The characteristics investigated in the Harman study are indicative of the academic work environment at the two different types of institutions featured in this study.

The pre-1987 universities' academics were better qualified, had better publication records, spent more time of research, and were more committed to research than those in the post-1987 universities. Differences in academic qualifications can be attributed to more time spent outside higher education for academics at post-1987 institutions and more emphasis placed on the importance of advancing your qualifications in pre-1987 institutions. Once advancement in qualifications is obtained, academics are promoted to more senior job ranks. Publication record and job seniority ranking were therefore found to be strongly linked with higher publication levels amongst senior academics. Publication at pre-1987 institutions was emphasized and academics were placed under pressure to obtain research grants. This in turn led to more time spent on research, where the post-1987 institutions had a greater emphasis on teaching. Since academics were being pressured to conduct research in pre-1987 institutions, they

consequently showed greater commitment to research when compared with post-1987 institutions. Academic units in the pre-1987 institutions were furthermore headed by professors and associate professors who had already conformed to the research pressure of the institution. As regards commitment to the institution, the post-1987 academics were more inclined to indicate that they were interested in other positions at other institutions. Overall it is important to indicate that the pre-1987 institutions showed markedly higher research output than the post-1987 institutions.

From the above study it can be deduced that similar factors impact on publication productivity but that institutional-type differences lead to differences in interpretation and outcome of these similar factors. These factors can be summarized as academic qualifications, time spent in a particular environment, job seniority level, emphasis placed on research/teaching, job seniority level of management and levels of commitment to the institution.

Other factors that have an impact on publication productivity in an academic environment are facilities and infrastructure as well as relationships within the institution. These are discussed next.

2.5.2 FACILITIES AND INFRASTRUCTURE

High-quality and relevant research requires a well-developed infrastructure (Shaw *et al.,* 2004, p. 93). This implies that if there is very poor infrastructure it places tremendous stress on academics to try to compete against others that do have access to a well-developed infrastructure. The need for infrastructure is further compounded in capital-intensive academic disciplines such as the natural sciences. Academics' perceptions of the availability and quality of infrastructure and other resources are not always objective (Fox, 1992, p. 108). This means that although an institution may have good-quality infrastructure and facilities, some academics might give it a poor rating and therefore use it as an excuse not to conduct research. The Teodorescu (2000, pp. 215-216) study of ten international countries found no support for the hypothesis that institutional research support (i.e. library holdings, laboratories, research equipment) predicts publication productivity. This means that in this particular study, which covered various academic disciplines in developed and developing nations, infrastructure was not a factor that predicted publication output.

Its importance should therefore not be overestimated, especially when lack of infrastructure and facilities are cited as reasons for low research output.

2.5.3 RELATIONSHIPS

Academic development is facilitated when academics work in a mentoring relationship with colleagues (Boice 1992; Luna & Cullen 1995 cited in Kreber, 2000, pp. 75-76). Collaborative relationships therefore support academic development and development in turn increases research output. Relationships are facilitated when there is an equal partnership with meaningful involvement as well as clear definitions of roles and responsibilities (Shaw *et al.,* 2004, p. 96). However, Fox (1992, p. 108) indicates that academics in undergraduate and postgraduate degree-granting departments, as compared with those in departments that grant undergraduate degrees only, characterize their departments as tense. Tense departments are defined as being unjust, cold, intolerant, unhelpful and competitive. These same departments are also described as strong, scientific and creative, however. This indicates that perhaps very warm relationships are not necessarily a prerequisite for a productive research environment, but rather that competition, disciplinary scientific norms and creativity are more important.

This section, together with sections three and four, covered the background to understanding the aspects of research that are formally managed within universities. Up to this point the chapter has provided a broad background to the research function within universities and the forces that impact on the changing nature of research in higher education institutions. This was followed by a description of what is meant by research and the differences in interpretation by different academic disciplines. Within institutions, the concepts of publication productivity and research output were explained. The manner in which HE institutions structure and organize themselves together with the resulting cultures followed. After this a discussion of the most prevalent research management practices and a description of the academic work environment were undertaken. The next section deals with attitudes toward teaching and research.

2.6 ATTITUDES TOWARD TEACHING AND RESEARCH

"Disciplinary characteristics do shape academics' attitudes..."

(Trowler, 1997, p. 309)

Attitudes toward teaching and research are explained by focusing on the 'research and teaching nexus' as well as on the concept of scholarship. Each of these is directly influenced by disciplinary characteristics.

2.6.1 RESEARCH AND TEACHING NEXUS

Of the roles that an academic has to fulfil, research and teaching are the most emphasized and researched. The research into the interaction between the two roles is also referred to as the 'research and teaching nexus' (Enders & Teichler 1997; Lacy & Sheenan 1997; Poole, Bornholt & Summers 1997; Takekazu 1998; Welch 1997, 1998; cited in Teodorescu, 2000, p. 205). This nexus is furthermore influenced by the academic culture that each discipline has, i.e.

> *"...the network of interrelated and explicit beliefs about academic practices of teaching, learning, and research, and about the social significance of these practices"*
>
> (Ringer, 1992, p. 13 cited in Wacquant, 1995, p. 181).

The academic culture of many disciplines conforms to the notion that to gain credibility an academic should be a respected researcher (Asmar, 2004, p. 56). Teaching is viewed as an activity that can be outsourced to part-time or junior lecturers and holds lower value and significance at universities (Serow *et al.*, 2002, p. 25).

Conflict between the two priorities of teaching and research has been a timeless issue in higher education (Serow, 2000, p. 449). Concerns about the nexus between research and teaching arise out of many issues. One such issue is the effect of **time**

spent on teaching, which is constantly blamed for a lack of research output, since in most universities teaching and research is conducted by the same individual (Vidal & Quintanilla, 2000, p. 218; Ebong, 2001, p. 11). It is important to note that time spent on research does not affect research productivity, except in the United Kingdom and the United States where more time spent translates into greater research output (Teodorescu, 2000, p. 215). Also, the time spent on teaching does not affect publication productivity negatively except in Japan (Teodorescu, 2000, p. 215). This means that having more time as a result of not teaching will not necessarily increase an individual's research output.

Another issue that arises in the research–teaching nexus is the fact that universities are accountable for teaching and not only research, irrespective of whether the institutions are highly ranked in research or not. Teaching forms part of the core functions of universities and careful consideration must be given to the **balance between teaching and research** in terms of resource allocation, status, capacity-building and performance management. Universities ". . . hire and promote faculty on the basis of competitive scholarly distinction" (Serow *et al.,* 2002, p. 25). This tends to increase an institution's ability to produce greater research output, which in turn produces more revenue and enhances prestige. The unintended consequence of this practice on undergraduate education should, however, be seriously considered. It should be balanced against the importance of the teaching function and the quality of teaching that undergraduates receive (Serow *et al.,* 2002, p. 26). It is furthermore important to note that some academics were employed at their institutions as 'teaching technicians', with no research responsibilities (Hazelkorn, 2003a, p. 4). Changes to employment conditions within changing higher education requirements impact on the identity of these academics and require special attention.

A third issue emerges from the fact that teaching and research are **evaluated and rewarded** differently. In most universities, the importance of research productivity outranks teaching quality in reward systems. International studies, as well as similar studies in South Africa, have indicated a strong, but not high, correlation between research productivity and individual dimensions of teaching effectiveness (Sutherland & Wolhuter, 2002, p. 77). In other words, academics who have a teaching load, and are good teachers, also have good research productivity rates. This indicates that good

teachers are also good researchers. A statement that 'good researchers are good teachers' is however refuted by Terenzini and Pascarella (1994 cited in Coate *et al.*, 2001, p. 172). Universities repeatedly set themselves up for failure in teaching, by linking promotion and merit pay to research productivity only. The cause of this problem lies partly in the ease with which research productivity can be measured – i.e. formal outputs. Teaching productivity and quality, on the other hand, relies more on the process of learning and acquiring knowledge, which is not easily quantifiable (Kreber, 2000, p. 76). Evaluation of teaching excellence should therefore not be exclusively based on output measures but should also include measures of process quality.

Together with the academic culture (as defined by Ringer), which is primarily aimed at the individual academic level, there are two other factors that influence the status afforded to teaching and research. These are the availability of resources and the management of these resources, as well as scholarship (Coate *et al.*, 2001, p. 172-173).

Scarcity in resources such as funds and human resources lead to institutions concentrating on areas of potential income-generation, such as research, at the cost of quality in teaching. In South Africa there is a skills shortage in the total economy. It stands to reason that the recruitment of highly specialized people into higher education (a sector with limited resources) is one of the fundamental challenges. Institutions therefore tend to invest in research staff and outsource teaching, since outsourcing alleviates human resource overheads such as pension and medical costs. "The role of the institution in shaping teaching-research relations is formative, that is, setting a general context . . ." (Jenkins *et al.*, 2003, p. 80). Taylor (2005, p. 3-4) argues that **institutional management** can have a greater influence than merely being 'formative'. He argues that purposeful management of the research and teaching relationship through a variety of management factors could assist institutions to optimize the relationship according to their unique requirements. Borrowing from the South African example, an institution has to purposefully make available financial resources for the attraction of specialists who teach and research, in order to maintain a balance in the nexus. Without this purposeful management, a skewed nexus will emerge.

Expanding on institutional management's influence on the research and teaching nexus, Hazelkorn (2002, pp. 13-14) emphasizes the fluidity of interaction between knowledge production, institutional mission and society. This fluid interaction is addressed through the Mode 2 knowledge production concepts of Gibbons *et al.*, (1995). The success of balance in the teaching and research nexus lies in how to **structure and organize** teaching and research at universities (Gibbons *et al.*, 1995, p. 137). Hazelkorn (2003a, p. 16) states that, depending on institutional stage of development and the particular emphasis in the research and teaching nexus, four models of research relationships and structures emerge (table 2-8).

Table 2-8: Model of institutional Teaching/Research relationships and structures (Hazelkorn 2003a, p. 16)

Model	R-T nexus	Organizational structures	Career implications
Type 1	T = R	Inclusive departments	Integrated
Type 2	T & R	Departments + units/centres	Active & inactive
Type 3	T | R	Departments + autonomous centres	Parallel pathways
Type 4	T ≠ R	University + autonomous institutes	Separate careers

Table 2-8 illustrates that, as research grows, depending on the preference in relationship between teaching and research, structures start emerging and these structures have an impact on the career paths of academics. Institutions that are inclined to view scholarship as intertwined action between research and teaching structure research and teaching into their departmental structures, ending up with large departments. Academic careers in this configuration integrate the roles of teaching and research. Progression to Type 4 is based increasingly on the divergence of teaching from research into two parallel structures and separate activities (Coaldrake & Stedman, 1999, p. 23 cited in Hazelkorn, 2002, p. 15; Coate *et al.*, 2001, p. 173). Institutions that structure their teaching activities totally separate from research are increasingly 'fragmented places of inquiry', but the growing of research at an institution is a process of individual moving to cluster (unit) moving to larger cluster (centre) (Hazelkorn, 2002, p. 15). Academic careers are also separate in the Type 4 model. In this sense, the strategy of 'growing' research and not simultaneously

placing an emphasis on the importance of teaching, leads to fragmented scholarship and no relationship between teaching and research.

Although research and teaching are clearly the two most acknowledged and researched of the roles of an academic, research and teaching are, too narrowly, seen as constituting scholarship in its entirety. In support of this notion there is the fact that the roles of an academic stretch wider than teaching and research (Hazelkorn, 2002, p. 7; Blaxter *et al.*, 1998, p. 284). Scholarship is discussed next.

2.6.2 SCHOLARSHIP

Scholarship is defined in many ways. The views expressed by Rice (1992, p. 117) exemplify the dominant approach, however. He sees research as central to scholarship and as associated with specialization in the pursuit of cognitive truth. The tasks associated with teaching are viewed as very different from those of research (Kreber, 2000, p. 75). Many authors therefore state that you cannot partake in scholarship if you are not conducting research.

Boyer (1990, p. 23) expands on the concept of scholarship and includes four areas: discovery, integration, application and teaching. In this enlarged view of scholarship (figure 2-5), Boyer (1990, p. 23-24) includes the scholarship of teaching, where teaching requires a systematic process of inquiry into one's own teaching practices and students' learning (Koch *et al.*, 2002, p. 84).

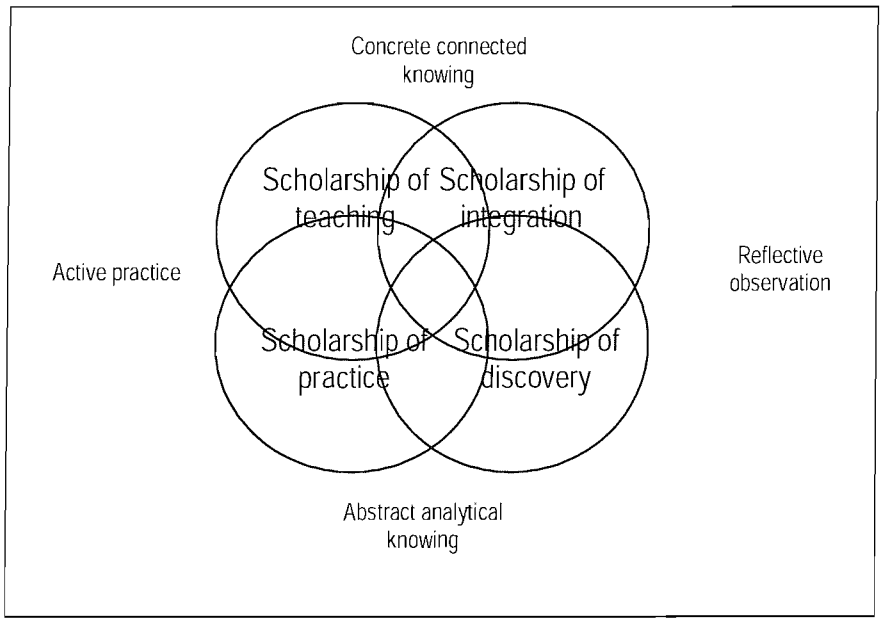


Figure 2-5: Enlarged view of scholarship (Boyer, 1990)

Boyer (1990, p. 25) contends that there should be recognition that knowledge is acquired through research, *and* through synthesis, *and* through practice *and* through teaching. Scholarship is therefore defined as a unity comprising research, teaching and service (Serow, 2000). The Boyer notion of scholarship also creates space for the role of writing, which is central to the work of an academic.

The Trowler (1997) quotation used at the beginning of this section indicates that the attitudes of academics are influenced by the disciplines in which they operate. These attitudes permeate the concept of scholarship, which in turn lays the foundation for the research and teaching nexus. The preferred view of the interaction between teaching and research in turn leads to organizational structures, which again influence the career paths of academics (see table 2-8).

The next section focuses on researchers. Researchers are described from the viewpoint of other actors in a university and the effect these actors have on researchers. The ways in which researchers collaborate and the personal attributes of successful researchers are also examined.

2.7 RESEARCHERS

2.7.1 ACTORS IN A UNIVERSITY STRUCTURE

There are two main actors in a university structure: managers (also referred to as administrators) and specialists (also referred to as knowledge workers). As explained in section three of this chapter, and illustrated again in figure 2-6, the role of administrator is performed in Mintzberg's *strategic apex*, the *middle line* and the *technostructure*. Specialist roles are performed in the *operating core* and *support staff* constellations. Researchers form part of the specialists and are therefore also referred to as knowledge workers.

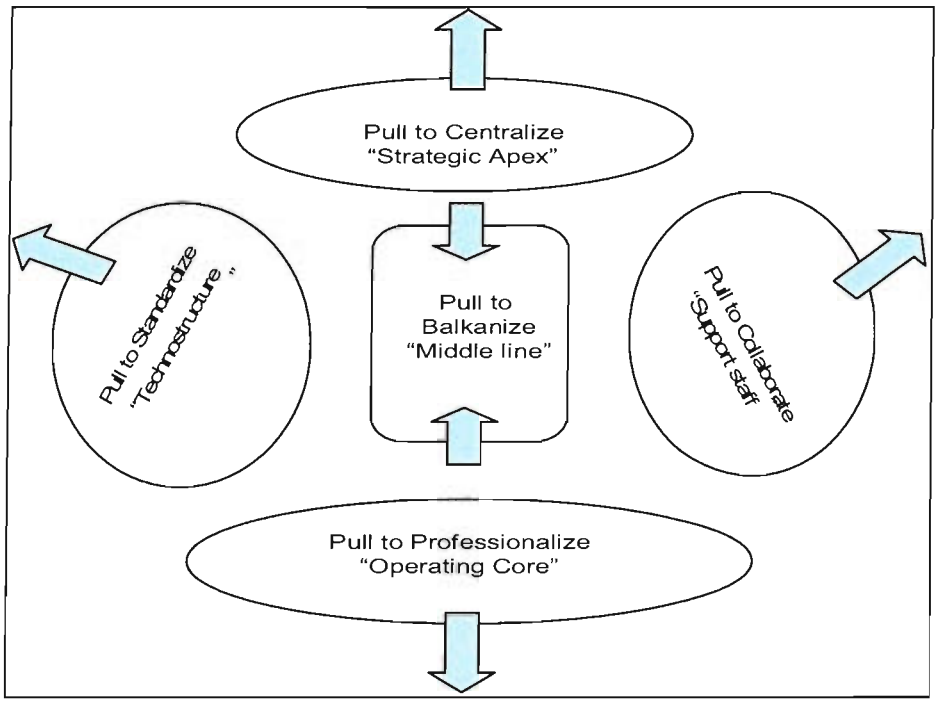


Figure 2-6: Five pulls on the organization (adapted from Mintzberg, 1983, p. 154)

General observations about specialists are four-fold (Baldridge 1983; Becher 1989; Becher & Kogan 1992; Blau 1994; Clark 1970; Clark 1983; Etzioni 1964; and Kerr 1995, cited in Sporn 1999, pp. 28-29). Firstly, specialists demand autonomy in their work. Specialists at universities have more autonomy to set the direction of their research than do their counterparts in industry (Ball & Butler, 2004, p. 89; Serow,

2000, p. 460). Secondly, the respective demands of their academic discipline, their profession and the institution itself give rise to divided loyalty on their part. Thirdly, specialists find themselves torn between the expectations of administrators, who are directed by external and institutional goals, and the values associated with knowledge production (freedom, experimentation and autonomy). Lastly, specialists attach great value to peer evaluation of their work, as opposed to externally administered standardized measurements such as governmental evaluations.

Administrators, on the other hand, are directed by external actors such as governments and are focused on efficiency and effectiveness. South African universities are large organizations that have been entrusted with expensive infrastructure and equipment to be used for the good of society. These institutions cannot function as integrated entities without appropriate management. Administration therefore moves into a new paradigm, away from merely implementing the instructions of external actors to a form of management in which institutional planning, operations and evaluation are integrated into a professional whole.

2.7.2 IMPLICATIONS OF RESEARCH MANAGEMENT FOR THE INDIVIDUAL ACADEMIC

> *"Institutions do not do research; individuals do. But institutional conditions affect productivity"*
>
> (Fox, 1992, p. 105).

The management of researchers with the drive to optimize the research output of institutions has led to new labels for categories of an individual researcher's research activity. Categories such as 'research-active', 'research-orientated', 'research-defunct' and 'research-negative' have started emerging (Hazelkorn, 2003a, p. 6). The labels themselves tell a story of 'use' versus 'uselessness', and hint at mounting pressure on academics to conduct research. One wonders whether the same labels will be given to teaching with the same level of disapproval (i.e. individuals being labelled 'teaching-negative/defunct'). Research management, and in particular the management of research nationally driven through HEFCE with the RAE in the United Kingdom, leads to several implications for academics (Henkel, 1999, p. 117-120). The implications for individual academics range from an impact on professional identities,

workload redistribution, status differentiation between teaching and research, pressure to publish, attempts to choose 'fashionable' research topics, differences in skill requirements for teaching and research, disturbances in the balance between a focus on undergraduate and postgraduate students, to lastly a strengthening of academic snobbery with associated competition.

Some of these consequences of managing research may sound negative and therefore one might reach the conclusion that research should not be purposefully managed. The purpose of mentioning the consequences that Henkel (1999) identifies is to draw attention to the fact that professional management should be mindful of the power of its decisions. Management can only be mindful if research is conducted into their practices, and practices in turn are informed through research.

There are various ways in which researchers at the operational level collaborate. These are discussed next.

2.7.3 MODELS OF RESEARCH ACTIVITY

Within the operating core, researchers function either independently or within groups. The task of overall research inquiry can be categorized into models for research activity, as determined by Shamai and Kfir (2002, p. 403). The intention of the models is that, as academics move from the first to the last model, the research culture of an institution is strengthened. The models are:

1. *Model of independent research*: Research is conducted independently by one or more researchers, with no central research core. Researchers compete against each other for research funding, and no connections with other studies are made.
2. *Star model*: The greater part of the research is conducted together with all the other researchers. The range of research is limited to the horizons and skills of the principal researcher; therefore the scope and quality of research is limited.
3. *Independent generalized model*: A core research team (the members of the research unit) is responsible for research, and a few additional staff members gather around it. Additional staff members carry out independent work. "This model keeps the proportion of collaborative studies by several researchers

low, as most staff members are not even involved in research as consumers" (Shamai & Kfir, 2002, p. 403).

4. *Collaborative centralized model:* A core research team (members of the research unit) gathers additional staff members around it, aside from the collaboration amongst team members themselves. The team is responsible for most of the research activity and inculcates a culture of research, as result of the fact that many academics are introduced to research. "...this model is based on a core of skilled personnel who stimulate research activity. The more cooperation there is among researchers and the more researchers gather around the central core, the more significant the development of a research culture" (Shamai & Kfir, 2002, p. 404).
5. *Multi-core model*: This occurs when two or more teams develop in an organization. "Each core is characterized by its form, either closed or centralized, or both collaborative and centralized. These models represent an increasingly strong college [unit] research culture" (Shamai & Kfir, 2002, p. 404).

Two implications of the above models emerge: - namely research topics are automatically more narrowly focused according to the group's research specialization – more so when the group moves toward the multi-core model. Whilst this might be one way to manage scarce resources, it could at the same time reduce research in other important areas. Secondly, as mentioned by Hazelkorn and Coate *et al.,* research might be increasingly separated from teaching the higher one moves up the models of collaboration (Coaldrake & Stedman, 1999, p. 23 cited in Hazelkorn, 2002, p. 15; Coate *et al.,* 2001, p. 173). The cause of this could be the increase in size and scope of research grants and projects for team-based research.

A researcher's collaboration environment and the impact of the actions of other actors have been discussed. The attributes of researchers will be explained next.

2.7.4 RESEARCHERS

Issues to consider when compiling an institution's policy on staff matters are time, having a pool of young researchers with constant research capacity development, the retention of good staff, and researcher training through the availability of networking

and travel opportunities (Di Sarli, 2002, p. 13). Institutional policy certainly is important in enhancing the environment in which researchers operate and may create opportunities for young and inexperienced researchers. The inherent competence and skills of individuals is important in the management of research since the research expertise of individuals attract postgraduate students to institutions (Shattock, 2003, p.131).

2.7.5 SKILLS AND COMPETENCE

High academic qualifications, although they certainly do imply that holders of qualifications have done some form of research in order to obtain these qualifications, do not guarantee high research output. Research knowledge and skills of academics, especially in quantitative research techniques, including statistics, or the lack thereof, are more indicative of eventual research output than qualifications per se (Schepers, 2001, p. 20). Liefner (2003, p. 485) holds the contrary view: he identified the qualifications of academics as the only decisive factor in the long-term success of universities. Liefner (2003, p. 485) followed this up by stating that a second factor that has significant impact on the long-term development of universities is the ability of its students (qualifications and motivation). Schepers and Blignaut (1994, p. 19), in another South African study, distinguish between knowledge of research methodology and research technology. Research methodology is concerned with the ability to plan and conduct research. Research technology refers to quantitative research where statistical analyses are relevant. It was found that although academics had a good knowledge of research methodology, there was very little knowledge of research technology (Schepers & Blignaut, 1994, p. 19). Moreover, research technology was a stronger predictor of research output than research methodology. Research technology, as defined in the Schepers study, will obviously differ in importance according to the conventions of specific academic disciplines.

Institutions could follow a strategy of investing in the training and mentorship of their own staff (Sanders, 2000, p. 3; Wojtas, 1997, p. 1) and/or they could decide to attract and retain people who already have the necessary skills and knowledge. In the latter strategy a creative environment, multidisciplinary perspectives, basic infrastructure, specialist technical and administrative support as well as career development

prospects were identified as essential to attracting qualified people (Liefner, 2003, p. 486; Goddard, 1996, p. 1).

2.7.6 INDIVIDUAL DEMOGRAPHICS

Age, and more specifically career age, is a strong predictor of research output (Fox, 1992, p. 108). Teodorescu's (2000, p. 213) study of ten countries indicates that age is only statistically significant in the United States and has no predictive power of research productivity in the other countries studied. Teodorescu found that academic rank, which traditionally relates to age, was a better predictor of publication productivity. Gender, furthermore, does not contribute to the explanation of productivity (Teodorescu, 2000, p. 213). Gender does, however, contribute indirectly to the prediction of research productivity in the United Kingdom, where the number of grants received by females was lower than that of males, and their research productivity relating to grant research also, therefore, lower.

Another aspect that has an influence on research productivity, and is related directly to an individual researcher, is professional activities.

2.7.7 PROFESSIONAL ACTIVITIES

Professional activities of academics are measured by the attendance of conferences and the membership of societies. These measures indicate the level of affiliation with an academic discipline. Harman (2001, p. 333) indicates that more time was spent on professional activities at pre-1987 institutions in Australia, where research output is the highest in the university sector, than at post-1987 institutions. In the Teodorescu (2000) study the number of conferences attended overseas was the single most important variable in predicting research output in Brazil, Israel, Korea and Mexico. This underscores the importance of access to international networks for academics in developing nations. From all of the studies mentioned it is evident that highly productive researchers, whether in developed or developing nations, communicate frequently with scholars in their disciplines at other institutions and in other nations (Pelz & Andrews 1966; Blacburn [sic], Behymer & Hall 1978; cited in Teodorescu, 2000, p. 214).

2.8 SUMMARY

Thus far I have attempted to provide detailed information, citing relevant research, that provides background to answering the study's first question, namely:

> *What are the factors that influence a productive research management environment at two merging higher education institutions?*

The factors that have been cited in this chapter range from extra- to intra-institutional. These factors suggest different organizational levels of research activity within institutions, and include research management practices and work conditions. Factors are furthermore linked to researchers as individuals, with their unique skills and competence, professional activities as well as attitudes toward teaching and research. Since I want to address the first question of this study specifically for the two merging institutions in question, I have to identify factors as described by the actors in these institutions. This will be done through interviews. However, the factors that were identified during the prior literature review are synthesized into a quantitative model. The purpose of this quantitative model is to address two of the secondary questions of the study, namely:

- Which factors are predictors of research output?
- Do certain factors vary according to different disciplines or between different staff groupings (e.g. by age, or gender)?

The quantitative model is presented in figure 2-7 and its application is discussed in chapter 3.

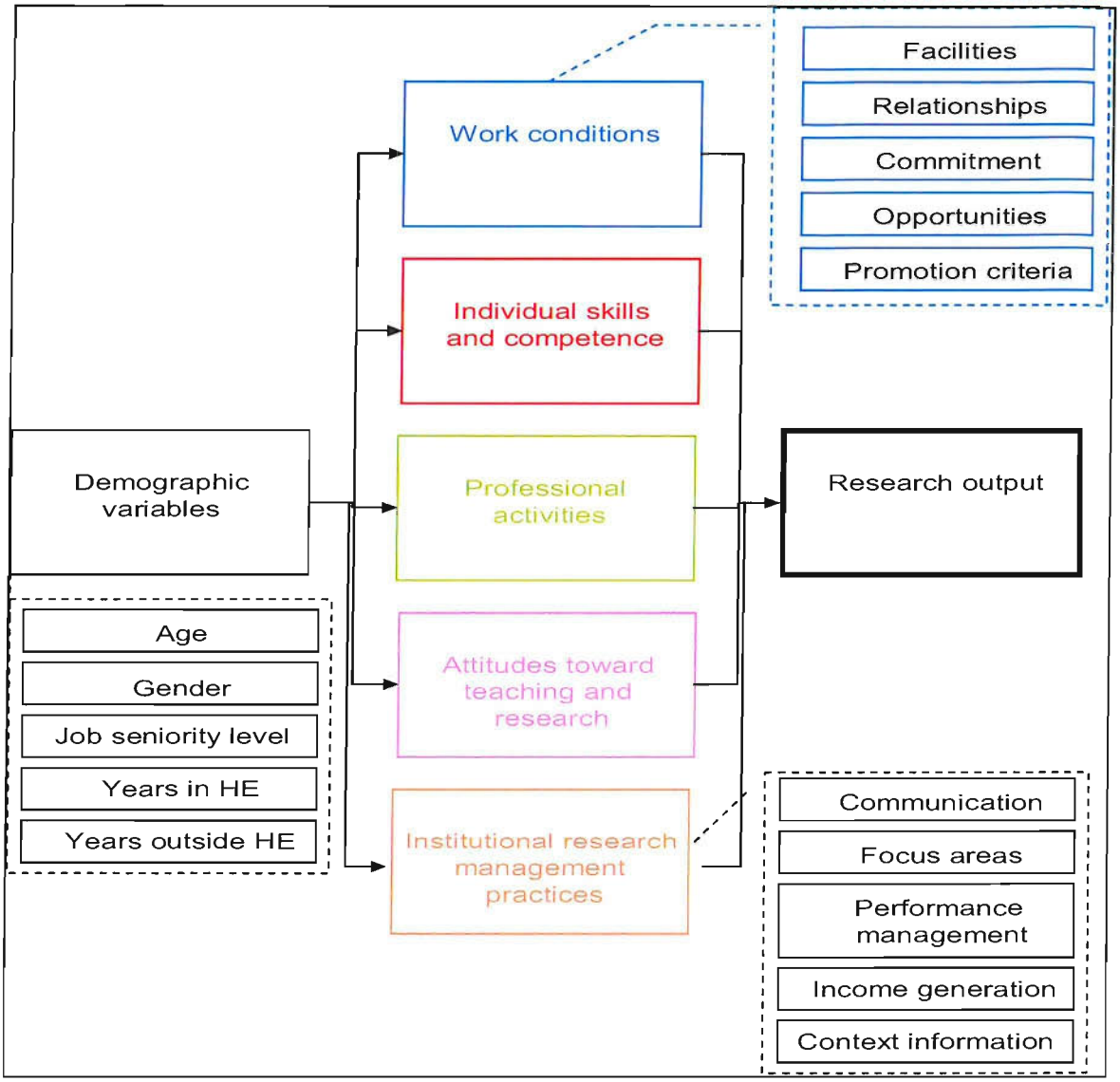


Figure 2-7: Research management questionnaire model

Section 8, the last section of this chapter provides the background to the second overall question of my study, namely:

> *What are the tangible as well as intangible factors that influence the delivery of research at two merging higher education institutions?*

This section is presented next.

2.9 TANGIBLES AND INTANGIBLES

The management of intangible assets is especially relevant in universities (Ball & Butler, 2004, p. 95). This statement is supported by Cinca *et al.,* (2003, p. 250), who indicate that intangibility is more present in public than in private enterprises. The inputs into universities are largely human and knowledge based. Both of these are largely intangible because they are based on services (Cinca *et al.,* 2003, p. 250). The formal and deliberate management of research therefore concerns itself not only with the management of tangibles but fundamentally with the management of intangible factors.

2.9.1 WHAT ARE INTANGIBLE FACTORS?

A summary of terms used (similar in meaning to intangible factors) include knowledge, invisible assets, absorptive capacity (Cohen & Levinthal, 1990), core competencies (Prahalad & Hamel, 1990), strategic assets, core capabilities (Zander & Kogut, 1995), intangible resources (Hall, 1992), and organizational memory (Walsh & Ungson, 1991), all cited in Sánchez *et al.* (2000, p. 314). Intangibility is furthermore a distinguishing feature of service organizations such as educational organizations (Mazzarol & Soutar, 1999, p. 288). The term 'tangible' usually refers to the tangible elements of services such as the physical equipment or other physical qualities of services (Santos, 2002, p. 292). Intangible characteristics of services are "...not possible to taste, feel, see, hear or smell before they are purchased" (Cowell, 1984 cited in Santos, 2002, p. 292). Celemi (cited in Galbreath, 2002, p. 124) categorizes intangible assets into customers, people competence and organization (internal structure). What all of the intangible factors have in common is that they are *difficult to quantify and are therefore not easy to measure; they are difficult to imitate by competitors, are not tracked through accounting* (Becker *et al.,* 2001, p. 7), *and they result in sustainable competitive advantage.* This definition is used for the purpose of my study.

Intangibles are usually handled in an informal way in the management of organizations (Sánchez *et al.,* 2000, p. 317). The management of intangibles does, however, require the formal identification of intangible factors and the optimization of such factors to create competitive advantage. Intangibles are best managed with an 'abundance mentality' (Becker *et al.,* 2001, p. 7).

Santos (2002, p. 294) indicates that universities have a medium level of tangible components in the service they deliver to students, i.e. books and tuition. The output of universities, however, is highly intangible since the tangible service elements are converted into intangible knowledge in each individual student, which is very difficult to measure. The RAE in the United Kingdom has created an explicit measure of the intangible assets of a university (Ball & Butler, 2004, p. 95). While this might be helpful in measuring knowledge-based output, the RAE does not measure all the intangible outputs, such as teaching, of a university.

For a university to increase its research output and create a productive environment in which research can be transferred into useful applications, it has to capitalize on its intangible factors. It is, however, essential to recognize that intangible factors alone are not sufficient for successful performance, and that tangible and intangible factors have to be combined into the optimum balance for institutions (Hussi & Ahonen, 2002, p. 278; Santos, 2002, p. 300).

Conclusion

This chapter has provided a detailed literature review of the issues that inform the main research questions. The chapter starts with broad-based issues that define research and knowledge production and moves through the sections that converge on the individual researcher in a university research system, which is discussed in section seven.

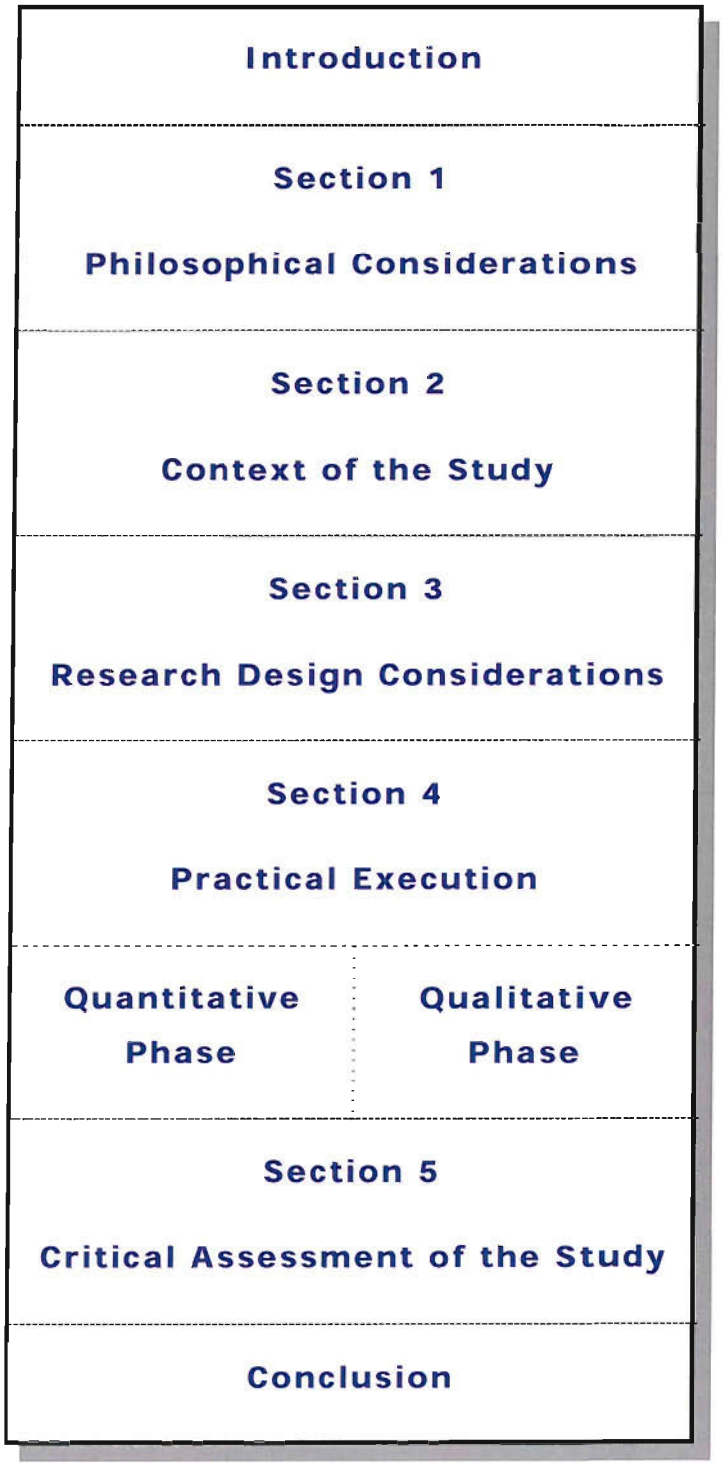
Sections one to seven of the chapter deal specifically with the first of the main research questions regarding the factors that influence a productive research environment. Section eight provides background to the second main question, namely clarification of the differences between tangible and intangible factors.

The next chapter will deal with the research methodology and design of this study.

CHAPTER 3

Explaining and Assessing the Study's Methodology

Layout of Chapter 3



Introduction

The purpose of this chapter is to explain research design and execution choices, and to offer an assessment of the quality and trustworthiness of the study. In order to do this, every analyst takes into consideration three sets of considerations, namely, philosophical, contextual and design (Baptiste, 2001, p. 2). In this chapter I first present an overview of the research paradigm utilized, which includes my position in respect of some key assumptions of science (covering the philosophical considerations). Secondly, I describe the study's context to provide an understanding of the rationale for choices made during design. Thirdly, I present the research design considerations. Fourthly, I describe the key steps during the practical execution of the research and, finally, I discuss the limitations of the study and outline how the study's design ensured quality research.

Section 1

3.1 PHILOSOPHICAL CONSIDERATIONS

Research is understood and applied differently in various contexts. This is a consequence of the varying nature and traditions of different academic disciplines. In addition, social science research, can be approached from three different paradigms or meta-theories. The three paradigms or meta-theories are positivism, naturalism (also referred to as interpretivism or phenomenology) and critical theory (also referred to as constructivism) (Gephart, 1999, p. 4-5; Neuman, 2000, p. 64; Denzin & Lincoln, 2000 cited in Baptiste, 2001, p. 4; Cohen, Manion & Morrison, 2003, p. 3; Babbie & Mouton, 2003, p. 48). Since the purpose of this study is not to contribute to research methodology directly, but rather to apply it, I shall make use of existing interpretations in this regard.[1] The aim of this section is to explore whether the different methodologies associated with the three paradigms can be combined.

A paradigm or meta-theory refers to the set of assumptions with which we view the world and, as a result of these differences, there are various schools of thought about the way in which social science research should be approached (Punch, 1998, p. 28; Babbie & Mouton, 2003, p. 49). Social science scholars use various frameworks to define and differentiate between the research paradigms and their associated research methodologies.

If the three above-mentioned research paradigms were placed on a continuum with positivism and interpretivism as the opposing poles (as illustrated in figure 3-1), critical theory can be placed between these two poles on the basis of ontological and epistemological assumptions.

---

[1] For the purposes of this study, the meaning attached to *methodology* is the inclusion of "...both the actual methods and techniques that social researchers use, as well as the underlying principles and assumptions regarding their use" (Babbie & Mouton, 2003, p. 49). Methodology therefore refers to the entire process of research, based on the underlying assumptions we hold of the world (Cohen, Manion & Morrison, 2003, p. 45).

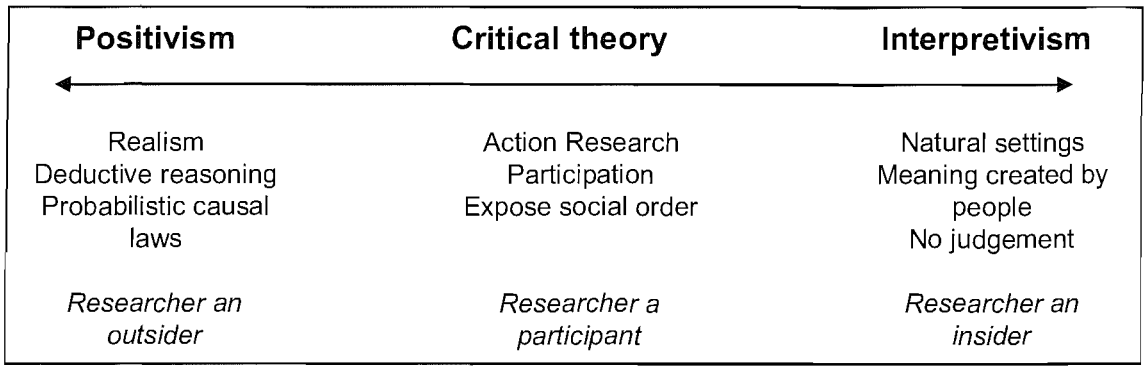


Figure 3-1: Research paradigm continuum
(Adapted from Babbie & Mouton (2003) and Gephart (1999))

To explain figure 3-1, positivism relies on

> *". . . organised methods for combining deductive logic with precise empirical observations of individual behaviour in order to discover and conform to a set of probabilistic causal laws that can be used to predict general patterns of human activity".*
>
> (Neuman, 2000, p. 66)

Positivism, therefore, adheres to realism and rational choice, where the researcher remains detached, neutral, and objective from that which is being investigated. The main aim of this research paradigm is to identify human behavioural patterns and to replicate the research of others. Positivism is overwhelmingly associated with the natural sciences, where elements in the research process can be tightly controlled (Hammersley, 1992, p. 41).

Interpretivism, on the other hand, is based on

> *". . . systematic analysis of socially meaningful action through direct and detailed observation of people in natural settings, in order to arrive at understandings and interpretations of how people relate and maintain their social worlds".*
>
> (Neuman, 2000, p. 71)

The assumption that interpretivists make, is that meaning is created amongst people who share a meaning system and therefore that their behaviour should only be interpreted according to the group's meaning system. Meaning, therefore, has prime

value. Given that the researcher might have another meaning system, interpretivists, as researchers, do not judge the behaviour of their research subjects but instead present the data through thick description.

In critical theory the influence on people of power and control over resources is investigated (Neuman, 2000, p. 76; Cohen *et al.,* 2003, p. 28; Gephart, 1999, p. 4). The aim of critical theory is to co-investigate, and build a shared view between researchers and research participants ". . . of what behaviour in a social democracy *should* entail" [emphasis in original quotation] (Fay, 1987, Morrison, 1995a, cited in Cohen *et al.,* 2003, p. 28). Participants, including the researcher, therefore construct their own new reality.

Table 3-1 provides commonly held divisions made by scientists regarding the differences between the two poles reflected in figure 3-1. Positivism is generally referred to as quantitative research, and interpretivism as qualitative research. Using sharp distinctions, without untidy overlaps, is a preoccupation of many scientists, but in reality ". . . a range of positions [are] sometimes located on more than one dimension" (Bryman, 1992, p. 51). Only in the critical theory paradigm is the combination of both qualitative and quantitative research 'permitted' in order to co-create a better future for the disenfranchised.

Table 3-1: Difference between quantitative and qualitative paradigms
(Compiled from Hammersley, 1992, pp. 41-50 and Cohen *et al.*, 2000, pp. 5-7)

	Quantitative paradigm	Qualitative paradigm
Data	Numeric	Words
Settings	Artificial	Natural
Focus	Behaviour	Meaning
Goals	Pursuing scientific laws	Identifying cultural patterns
Epistemology	Realism – reality exists out there	Idealism – there are as many realities as there are persons
Human nature	Determinism	Voluntarism
Ontology	Social life exist independent of human consciousness	Social life is constructed by human interaction

These very sharp distinctions and rigid rules do not reflect the reality of everyday social research. Miles and Huberman (1994, pp. 4-5) indicate that:

> *"In epistemological debates it is tempting to operate at the poles. But in the actual practice of empirical research, we believe that all of us – realists, interpretivists, critical theorists – are closer to the center, with multiple overlaps".*

A straightforward distinction between qualitative and quantitative research therefore misrepresents the basis on which research decisions, such as the choice of methodology, are made (Bryman, 1992, p. 52). The combining of qualitative and quantitative methodology does occur since qualitative and quantitative approaches are not forever rooted in their different epistemological positions (Bryman, 1992, p. 59). This leads to a new style of research where field (interpretivism) and survey (positivism) methods are integrated (Sieber, 1973 cited in Brannen, 1992, p. xii). The new style of research is referred to as methodological complementarism (Weinberg, 1975, p. 116 cited in Yolles, 1996, p. 527), multiple research strategies (Burgess, 1982 cited in Brannen, 1992, p. 11) and triangulation (Denzin, 1970, p. 310). The most commonly held notion of combining methodologies is where more than one method of investigation, and by implication data type, is used (Bryman, 1988, p. 131). The combination of methodologies recognizes the differences of each paradigm and its associated methodologies, but aims to harness various methodologies and their strengths in a ". . . complementary way for a given situation" (Yolles, 1996, p. 527). This means that the different data sets produced by each method are treated as complementary and not ". . . integrated unproblematically" (Brannen, 1992, p. xiii).

The combining of methods is encouraged in instances where the research questions are better answered through combination (Punch, 1998, p. 62). Patton supports this sentiment by stating that sensible decisions regarding methods should be led by the purpose of inquiry, not by uniformly adhering to the rules of a paradigm (1990, p. 39 cited in Schurink, 2004b, p. 9). Substantive choices therefore dictate methodological choices, implying that the research question and context ". . . guide the decision to employ qualitative or quantitative research" (Bryman, 1992, p. 69) or indeed a combination of both. Fielding and Fielding (1986, p. 75) indicate that, in combining methods, researchers can reveal aspects of the problem that their strongest method, used alone, would overlook. As an example, the combining of methods has been especially noticeable in evaluation research (Schurink, 2004b, p. 9).

Combining methods is not the same as using a *single research instrument* to derive two sets of data, namely qualitative and quantitative (Bryman, 1992, p. 70). Nor is it correct to combine qualitative and quantitative *data analysis approaches* applied to a single set of data, or to *combine data sets* derived from two research methods (Bryman, 1992, p. 70). Of importance is the use of more than one method of collecting two (or more) sets of data – predominantly based on different research questions or aspects of the research problem, since ". . . it is questionable whether quantitative and qualitative research are tapping into the same things even when they are investigating apparently similar issues" (Bryman, 1992, p. 64).

There is, however, another approach where different methods are used to collect two sets of data on the basis of the same research question. Denzin's (1970) view of triangulation for quality control goes further than the complementary use of different methods in the same study, and includes the use of multiple methods, multiple investigators, multiple data sets and multiple theories (Brannen, 1992, pp. 11-12). With *multiple methods*, the same method is used on multiple occasions and/or different methods are used in relation to the same object of study. *Multiple investigators* are used in instances in which research is carried out in collaboration with others. *Multiple data sets* are derived from the use of different methods or with the same method at different times and from different sources. Where researchers base a single study on more than one theory and then set out to test all of the theories, one refers to *multiple theories*. The intention of Denzin's triangulation, therefore, is to enhance the quality of research by viewing a research problem from multiple perspectives.

In conclusion, May (2001, p. 27) states that a researcher who is aware of the paradigmatic differences, but acts "reflexively, is more likely to produce an enhanced and systematic study of social life". Furthermore, methodological choices are frequently steered by considerations other than fundamental assumptions (Platt, 1996, p. 275 cited in May, 2001, p. 26). Both these statements capture the paradigmatic thinking of my study. In the next section, I shall explain the context of my study in order to defend the reflexive combination of methodologies that I employed.

3.2 CONTEXT OF THE STUDY

In this section I explain the contextual factors of the study in order to clarify the rationale for combining methods. The flow of the section will be based on the order (below) of reasons for the use of multiple research strategies, which are located in

- the purpose of inquiry (Fielding & Fielding, 1986; Punch, 1989; Bryman, 1992; Brannen, 1992; Hammersley, 1992; Patton cited in Schurink, 2004b);
- the organizational context and political climate (Bryman, 1992, p. 68);
- the wishes and preference of constituencies (Bryman, 1992, p. 68);
- pragmatic considerations such as access to data, increasing response rates and participation (Bryman, 1992, p. 68-69);
- quality control (Fielding & Fielding, 1986, p. 97); and
- the researcher's values and beliefs.

3.2.1 PURPOSE OF INQUIRY

The need for a study of research management emerged at the beginning of 2002, initially at the university case institution, as a result of the institution's strategic goal to move from being research-driven to research-led. This was followed by an announcement by the Minister of Education in May of 2002 that the university would integrate, into its existing structures, two campuses of another university that was unbundled during 2003. Subsequently the integrated university would merge with a technikon during 2005 to become a new comprehensive university. The investigation of the management of research for the new merged institution moved to highest priority in the list of merger issues, since the merged institution wanted to retain its research character, develop research as an institutional priority and increase its overall research output.

Therefore the overall purpose of my study is:

To identify the factors that influence a productive research environment at two merging higher education institutions, in order to inform the new research management system for the merged institution.

In order to achieve the above purpose, a combination of methods was utilized and the study was split into a quantitative and a qualitative phase. I deliberately chose to combine methods since I am of the opinion that a quantitative study alone would not identify the detail of 'softer' or intangible factors that influence a productive research environment. Furthermore, a quantitative study is based on a literature study, which informs the questions of a survey. I wanted to ensure that the findings of the study would not be restricted by the items identified by me in the literature study; therefore I also opted to follow up the quantitative phase of the study with a qualitative phase. The qualitative phase, furthermore, resulted in diagrammatic networks that were constructed from the meaning that participants gave to their data. Conversely, a qualitative study alone would not provide 'hard' statistical evidence of the factors that predict research output, and by implication influence a productive research environment. Furthermore, a quantitative approach ensured coverage of large numbers of participants, which a qualitative study could not achieve within time and budgetary constraints.

The quantitative phase preceded the qualitative phase due to pragmatic considerations such as access to data.

On the basis of the above, the objectives of the quantitative phase of the study were twofold:

1. To determine which factors, as identified in a literature study as well as through a factor analysis, were predictive of the dependent variable 'research output'.

2. To determine whether these factors differ according to age, gender, experience in and outside of higher education, job seniority level, and academic discipline.

The *methods* used to achieve the above objectives were:

- an in-depth literature study;
- soliciting the opinions of the academic staff members of the two institutions by means of a social survey; and
- documentary analysis of annual reports and other research-related documents of the two institutions.

The second phase of the study – namely, the qualitative phase – had the following four objectives:

1. To determine which factors influenced a productive research environment at institutional level at the merging institution.
2. To identify both the tangible as well as the intangible factors that influence a productive research environment at institutional level at the merging higher education institution.
3. To determine the interactions between tangible and intangible factors.
4. To determine the levels of research management as well as their corresponding purposes and interaction.

The methods utilized to achieve the objectives of the qualitative phase were:

- conducting unstructured interviews with senior management directly involved in research management at the two institutions; and
- compiling reports based on the findings to serve as input into the policy formulation process at the merged institution. Reaction to the reports served to validate findings but also led to further policy document analysis.

3.2.2 ORGANIZATIONAL CONTEXT AND POLITICAL CLIMATE

Data on the different case institutions and my rationale for choosing them are provided in chapter 1. As regards the overall institutional climate, the two institutions were in the midst of preparations for a forced merger at the time in which the study's data collection was done. Considerable hostility existed between the management teams and academics of the two institutions. People felt that the opposing institution was the 'enemy' and were concerned that information could be used against them or the institution. This meant that access to documentation and other forms of data was very difficult to gain and in some instances access was denied. In order to overcome the hostility, I reassured participants in both phases of anonymity. The survey was returned without identifiable information. Furthermore, I explained to the participants in the qualitative phase of the study that their data would be combined with the data of the other participants (qualitative data sets) during analysis in order to arrive at aggregated senior management findings instead of the stories of individuals. In instances where access to data was denied I verified data verbally by speaking to individuals who had access to the data and were prepared to share information.

I formally requested, and obtained, permission to execute the study at both institutions. At the technikon I had to request permission from senior management to speak to people before making contact. The university was more open in this regard and allowed me free access to participants. I furthermore had to agree not to publish any findings until the university and technikon management approved these, in order to ensure that the merged institution's research profile was not negatively affected. Anonymity is therefore of great importance.

3.2.3 THE WISHES AND PREFERENCE OF CONSTITUENCIES

> *". . . there is an urgent need to emphasise the role of the academic as an important actor in the study of policy implementation in higher education"*
>
> Trowler (1997, p. 301)

Researchers experience research as an intensely personal issue, largely based on preference, passion and strong sentiments. In this light, Trowler's statement, together with the previous sentence, highlights the imperative for my study to demonstrate the involvement of all academic staff members. A survey was the only research method

that could demonstrate that all academics had an equal opportunity to participate. Statistical results are furthermore, as a consequence of their purported 'neutral' unbiased results, unfortunately more readily accepted for managerial decision-making purposes than richly layered qualitative findings. Since the overall purpose of the study is to inform policy formulation, the study's results had to 'speak the language of the ultimate users', the university managers, and it had to reflect the opinions of academic staff members.

The qualitative phase provided each senior manager involved in research management with the opportunity to air his or her views and provide insight into the factors that influence a productive research environment at the institution. All the existing academic and management staff at each of the institutions remained in the same positions at the merged university and therefore they would still be the managers of research at the merged institution, where new policy had to be formulated. It therefore made sense to obtain the qualitative data from these participants.

3.2.4 PRAGMATIC CONSIDERATIONS

The sequence of research phases of the study, namely first the quantitative phase, followed by the qualitative phase, came about as a result of the reality of institutional configurations and re-configurations as well as access to participants and data. Although the study commenced in August 2003, access to interview senior management at the two institutions was only granted in May 2004, when the qualitative phase of the study commenced. More detail about the timeline of the study is presented under section 4 of this chapter.

3.2.5 QUALITY CONTROL

The results of the quantitative phase were used to verify the findings of the qualitative phase. Validity and reliability in qualitative research can also be dealt with through triangulation (Babbie & Mouton, 2003, p. 275). Triangulation, as defined by Denzin (1989, p. 236 cited in Babbie & Mouton, 2003, p. 275) is ". . . the use of multiple methods . . . that will raise [social science researchers] above personal biases that stem from single methodologies". I made use of triangulation in two ways. Firstly I did so by comparing the codes on the networks with items identified in a literature study and data obtained from the questionnaires. Secondly, the triangulation

procedure was that the qualitative findings were analyzed and presented in network form before the final quantitative analysis was done. The results of the quantitative phase of the study were then compared with the results of the qualitative phase. This ensured that the quantitative results did not influence me in the compilation of the qualitative networks, but could be used for triangulation purposes.

Rigour was also ensured by follow-up interviews with participants of the qualitative study. All the participants were requested to verify networks and all interpretations made by me.

Data on research outputs obtained from the survey was also verified by the analysis of documents as well discussions with specific individuals in cases in which documents could not be accessed.

In addition, after analysis, the results of the phases were presented in four reports to all levels of management and to all academics within the two institutions. Academics and all other stakeholders were given the opportunity to comment, and amendments made where necessary. Policy documents that emerged after the reports served as further data to verify or refute findings of the qualitative phase.

3.2.6 EXPLICATING THE RESEARCHER'S BELIEFS

Some underlying values and beliefs that I hold of the world have already been explicated under the discussions of the other reasons for the combining of methodologies. However, in conclusion, the following must be mentioned:

- I believe that reality is co-constructed by individuals through the meaning and interpretation shared by individuals. The construction of reality, through decision-making is, however, influenced by control and power over resources. This thinking is in line with worldviews held under social constructionism and critical theory.
- I believe any recommendations for action presented in chapter 6, based on findings, contain value judgements (Punch, 1998, p. 53).
- From an interpretive perspective there are three strategies which are arguably particularly important when it comes to checking and demonstrating how researcher bias and inappropriate subjectivity are managed. These are: (i)

reflexivity, (ii) the audit trail, and (iii) peer debriefing (Schurink, 2005, p. 17). I believe that, as a researcher, I am part of the entire research process, not in all instances as a participant, but definitely not as a neutral observer. It also means that I have to caution myself not to read into situations what other participants do not see or mean, and also not to impose my preferences onto the process. In all instances I ensured that there was full support from the participants by requesting them to verify findings. Being part of the research enriched the study, since it meant that I could use my own experience at my institution, together with the experience of other participants, to fill in the gaps in order to reach understanding where data was not available.

- There are three issues considering the ethics of a study: the research setting, the language of instruction and the researcher-participant interaction (Schurink, 2004a, p. 10). On the basis of these three issues I can attest that, ethically, the research participants have not been compromised in any manner. I have ensured that participants and institutions are not easily identifiable, by making use of pseudonyms. I have also included participants in feedback and decision-making that influenced them directly so that they were able to contextualize or explain findings. Where participants made use of Afrikaans as the language of interaction, I have translated the text so that individuals cannot be identified in this manner. During my interactions with participants I found that some pressured me to reveal who said what in the course of our discussions. I did not succumb to this pressure and maintained that mutual respect, including anonymity, and our professional interactions would assist the merger process. Although some senior managers are still not seeing eye-to-eye on many issues, the issue of research management has been opened for discussion, and progress with regard to policy formulation has been made.
- I believe that social action is tied to particular occasions and other participants in the situation (Fielding & Fielding, 1986, p. 76). The merged university's research management system will initially be based on the history, culture and practices of the two merger partner institutions. This implies that, through the combination of data from the two case institutions, a picture of the system of the merged university is formed, from which policy decisions can be made.

3.3 RESEARCH DESIGN CONSIDERATIONS

Research design in essence is *planning* or a complete plan for ". . . attack on the central research problem" (Leedy & Ormrod, 2001, p. 91). The research design ". . . focuses on the end-product: What kind of study is being planned and what kinds of results are aimed at" (Babbie & Mouton, 2003, p. 75). Not surprisingly, social science researchers have developed different qualitative and quantitative research designs. While the present study is a combination of both qualitative and quantitative research methodology, it primarily, reflects a case study research design. The methods that were utilized in investigating this case were a social survey, unstructured interviews and document analysis.

3.3.1 CASE STUDY

It is clear that the word 'case' is not well-defined by social scientists. Perhaps some of the most important remarks on 'cases' are:

> *"First, case study research can be based on single- or multiple-case studies; second, whether single or multiple, the case study can be exploratory, descriptive, or explanatory (causal)"*
>
> (Yin, 2003, p. 3)

and

> *"The cases may be chosen to replicate previous cases or extend theory, or they may be chosen to fill theoretical categories and provide examples of polar types . . . [g]iven the limited number of cases which can usually be studied, it makes sense to choose cases such as extreme situations and polar types in which the process of interest is transparently observable"*
>
> (Eisenhardt, 2002, pp. 12-13).

Case studies can furthermore be based on any mix of qualitative and quantitative evidence (Yin, 2003, p. 15).

My study is based on two exploratory cases which are polar types of institutions. Descriptive and explanatory case studies are based on propositions (similar to hypotheses in survey research) (Yin, 2003, p. 22). My study is not based on propositions but does have a distinct purpose, which exploratory case studies should have (Yin, 2003, p. 22). Stake (1995, p. 3) refers to intrinsic, instrumental and collective case study types. Using his terminology, my study is a collective case study since it focuses on more than one case.

Case studies are typically focused on answering 'how' or 'why' research questions (Yin, 2003, p. 9), or on stating the issue that the case(s) represents (Stake, 1995, p. 18). In my study the cases represent factors that influence research at two merging institutions. Furthermore, in many instances case studies are characterized by a single unit of analysis, such as an organization or a person. Since my study incorporated both quantitative and qualitative methodology, the unit of analysis cannot be the same for both types of methodology. To this end the quantitative phase of my study utilizes the survey method (individual academics are the unit of analysis) and the qualitative phase of my research utilizes the method of unstructured interviews (unit of analysis is the senior management group of the merged university). In combining qualitative and quantitative research I have blurred boundaries with respect to traditional research methodology conventions since I chose to remain true to the overall purpose of my study. During data collection and data analysis I have, however, conformed to traditional principles of my chosen research design, methods and analysis approaches. The latter two are stated in table 3-2.

Table 3-2: Research methods and analysis approaches

	Quantitative phase	Qualitative phase
Data collection method	Survey Documents	Unstructured interviews
Data analysis method/approach	Chi square test Cronbach alpha test Factor analysis ANOVA CHAID analysis Regression analysis Document analysis	Miles & Huberman transcendental realism Primarily inductive analysis Atlas.ti computerized software based on grounded theory
Triangulation	Comparison of results from qualitative phase with results from quantitative phase	

3.3.2 RESEARCH QUESTIONS

The research questions that flow from the purposes of both the quantitative and qualitative phases of the study are as follows:

The main research questions are:

1. What are the factors that influence a productive research management environment at two merging higher education institutions?
2. What are the tangible as well as intangible factors that influence the delivery of research at each of the two higher education institutions?

The secondary research questions are:

a. What are the systemic interactions between the tangible and intangible factors?
b. Are there different purposes for the research management function and, if so, what are the dynamics between these purposes?
c. Do these factors correspond with any particular organizational levels in an organigram?
d. Which factors are predictors of research output?
e. Do certain factors vary according to different disciplines or between different staff groupings (e.g. by age, or gender)?

Section 4

3.4 PRACTICAL EXECUTION OF THE STUDY

The purpose of this section is to describe the detail of the practical actions taken in each phase of the study. A chronological account or "natural history" of the project, as provided by the researcher, was introduced to deal with at least some of the criticism levelled at qualitative research projects, particularly those of the modernistic movement (Becker, 1970).

Timeline

Research planning, data collection and data analysis occupied the period from August 2003 to March 2005. The study's timeline is illustrated in figure 3-2.

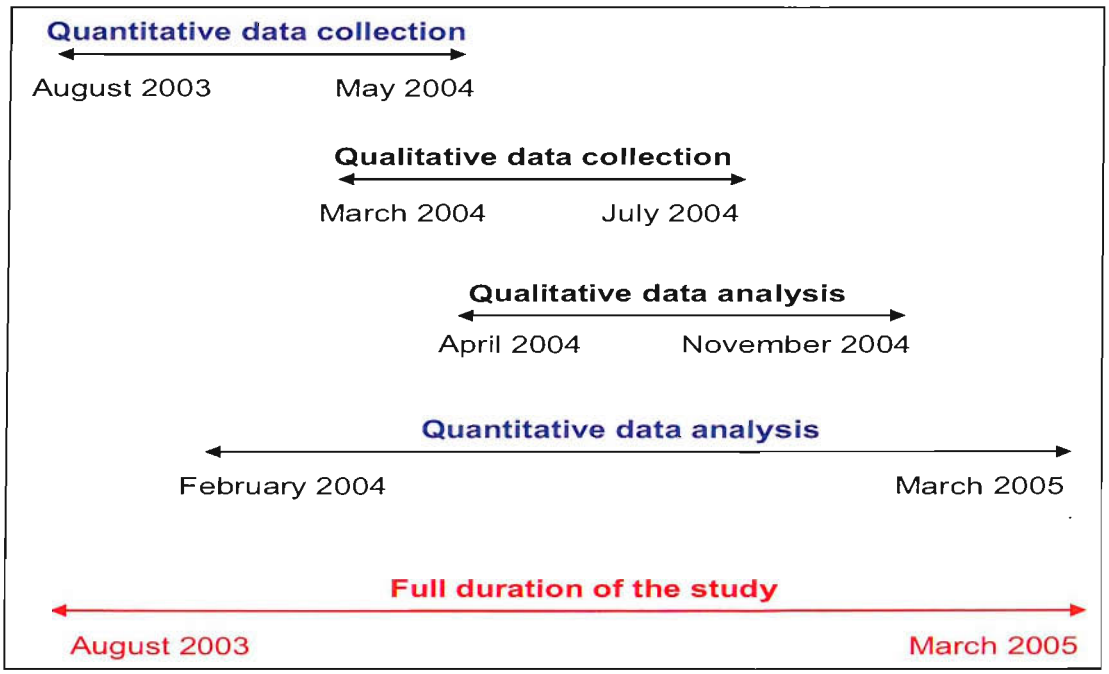


Figure 3-2: Timeline

The study commenced with the Quantitative phase since access to academics was provided at that time. The time line of the Qualitative phase overlapped with that of the Quantitative phase. Data analysis took place throughout the data collection periods and ended in March 2005. Analysis of the qualitative data was completed before the analysis of the quantitative data was done. This ensured that the results of the quantitative phase did not influence the results of the qualitative phase. Writing up of

reports and the thesis took place throughout the study once analyses of results were completed, and in some instances, the writing of reports to various stakeholders encouraged greater analytical depth.

QUANTITATIVE PHASE

The objective of the quantitative phase of the study was twofold:

To determine which factors, as identified in a literature study as well as through a factor analysis, were predictive of the dependent variable 'research output'.

To determine whether these factors differ according to age, gender, experience in and outside of higher education, job seniority level and academic discipline.

I chose to administer a survey for the following reasons:

- I wanted to determine which factors were predictive of the dependent variable 'research output'.
- A questionnaire afforded the opportunity for all the academics at the two institutions to participate in the study, thereby giving their input into the creation of a new research management system at the merged institution.
- Questionnaires are useful for measuring attitudes and orientations in a large population, which was appropriate for a study spread over five campuses (Babbie & Mouton, 2003, p. 232).
- A questionnaire furthermore provided me with a manner in which structured data collection, as opposed to standardized or unstructured data collection (Dixon, 1989, p. 13-14) could be done, in order to make comparisons between the summarized units of analysis in a cross-sectional study at one time (Babbie & Mouton, 2003, p. 90).
- Given the sensitivity and suspicion among personnel during the merger, the anonymity of respondents could be guaranteed through the use of a questionnaire.
- Financially, the administration of questionnaires made the most sense in comparison to telephonic and other forms of surveys.

- Research management is devolved to the faculties and departments at the university and centrally controlled at the technikon. Information regarding research output and workload, as well as teaching load and research activity was not available from a centralized point or system at either of the institutions. Data held at institutional, faculty and departmental levels is also not comparable, hence the use of a questionnaire to obtain comparable data on these issues.
- The target groups are well versed in the completion of self-completion questionnaires.

3.4.1 SURVEY DESIGN AND DEVELOPMENT

Surveys have their origin in the positivistic tradition, and whilst some set out to test theories, others aim to construct theories. All surveys, however, begin with some theory (Williams, 1997, p. 64). I compiled a self-completion questionnaire called the "Survey on the State of Research at [institution's name]" during August 2003. Certain questions of the questionnaire were based on the Carnegie Foundation for the Advancement of Teaching's 1998 survey called the "International Survey of the Academic Profession" (Teodorescu, 2000) – discussed in chapter 2. Permission to adapt the questionnaire was obtained from the Carnegie Foundation. The questionnaire used during my study was adapted to a great extent to reflect national jargon, institutional-specific imperatives as well as my literature study's findings. Furthermore, the Carnegie survey focused on the whole academic profession, with equal emphasis on the different elements of the profession. My study focused on research as part of the academic profession. The theoretical model on which my study was based is illustrated in figure 3-3.

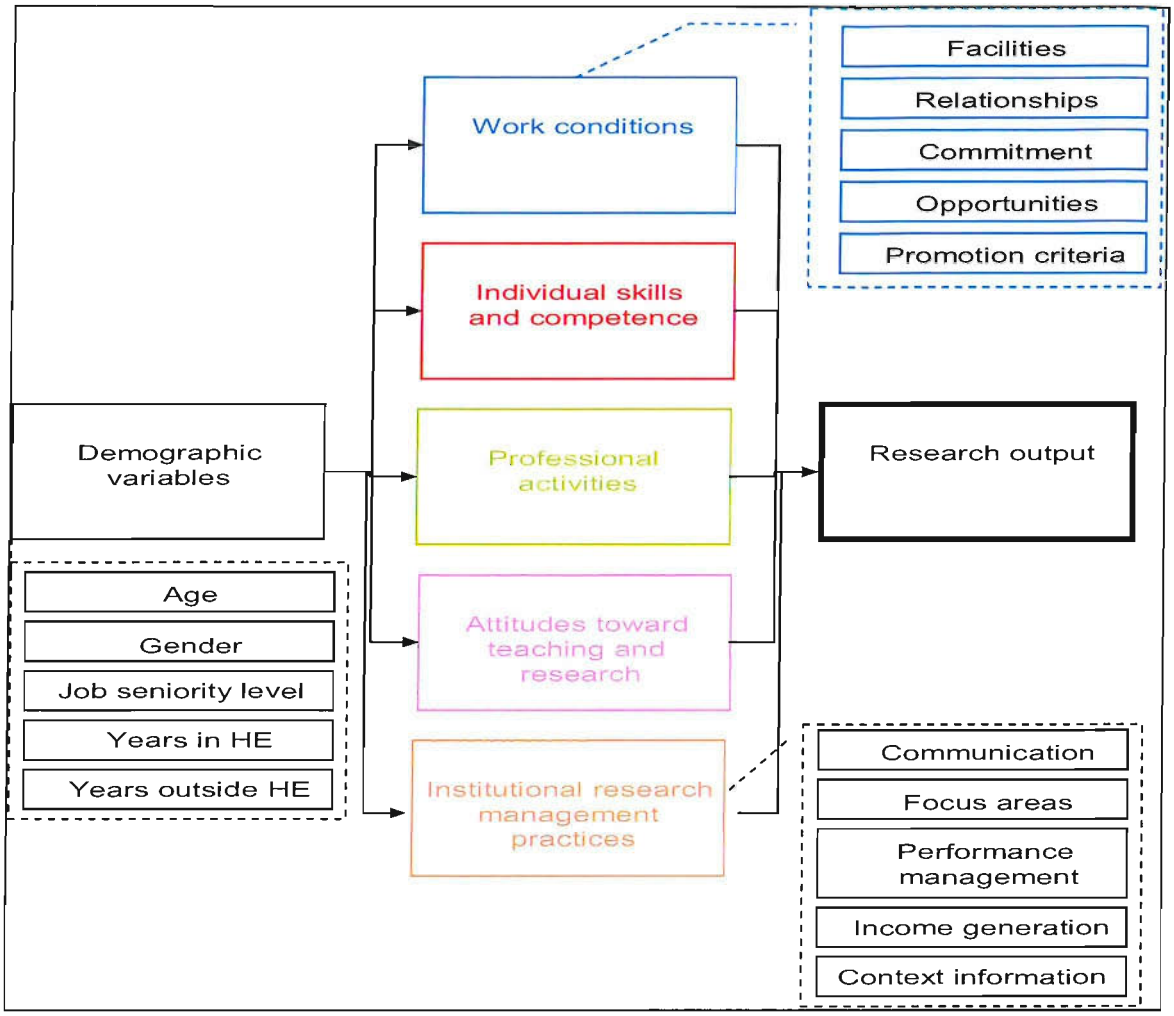


Figure 3-3: Quantitative theoretical model

A comparison of the questions in the questionnaire and the parcels in the theoretical model is provided in Appendix II. Copies of the questionnaire are attached in Appendix I. The actual layout of the questionnaire does not correspond precisely with the layout of the theoretical model: instead, the layout of the questionnaire consists of five sections. The five sections were used to simplify the questionnaire structure from the point of view of the respondent. The five sections are described below and I have indicated in brackets which parcel of the theoretical model the section covers, next to the section's title.

Layout and sections of the survey

A *Personal information* (**demographic variables**) – demographic information was elicited from respondents to ensure that comparisons through cross-tabulation could be made between certain categories such as gender, age, race, years employed in higher education as well as years employed outside of higher education.

B *Working conditions* (**work conditions**) – in this section each respondent had to reflect on time and human resources that are available to him/her for teaching and research.

C *Research output* (**research output** and **professional activities**) – respondents were probed on their research output, which was broken down into detailed categories, and had to indicate their professional activities as well as the sources of their research funding.

D *Opinions* (**individual skills and competence** and **attitudes towards teaching and research**) – respondents were probed on their perceptions and opinions relating to academic matters and research: the teaching-research nexus, application of research, facilities relating to research, relationships at their institution, perceptions regarding the meaning of research, the meaning of an academic's work, status associated with research and disciplines, etc.

E *Research management practices* (**institutional research management practices**) – the last section explored the effectiveness of communication regarding research, research focus areas, performance management, income generation from research results and the research structures, as well as their position in the university hierarchy.

The questionnaire was administered on campus A and thereafter refined for campus C. Both these campuses form part of the university. In order to reflect the jargon and uniqueness of the technikon environment, the questionnaire was adapted for campus B. Table 3-3 indicates the number of main questions for each section of the different versions of the questionnaire. The fifth column of table 3-3 indicates the exact changes in questions to address institutional-specific imperatives.

Table 3-3: Adaptation of questions between questionnaires

Section on the questionnaire	Campus A and C questionnaire - number of main questions	Campus B questionnaire – number of main questions	Type of question posed (Schnetler, 1989, p. 42-43)	Change in question between campus A & C and Campus B questionnaires
Section A	10	11	Factual questions	Race category added before sending to campus C and campus B. Faculty, job seniority level, information adapted according to the institution's practices.
Section B	10	11	Factual questions	Number of hours spent on activities changed into two questions
Section C	6	6	Factual questions	None
Section D	22	22	Opinion and attitudinal questions	None
Section E	11	11	Behavioural questions and opinion questions	Question about functioning of research committees versus research office changed for campus B

Question Format

Various question formats were used for the construction of the questionnaire. Owing to its length, the questionnaire had no open-ended questions. Even though there were no open-ended questions, academics made many written comments on their paper-based copies, and these were captured and included in the data analysis and reporting.

Table 3-4 indicates what question format was used in each section of the questionnaire. Various question formats were employed in order to ensure that the questionnaire contained variety and that, as a result of the length of the questionnaire, the respondents did not become indifferent in their responses and had to read each question carefully. *Dichotomous* questions were used where respondents had to make a clear choice between two alternatives. *Multiple choice* questions were used where answers to the question were pre-empted by me and could be categorized into discrete units that did not overlap with each other. *Filter* questions were always followed by *follow-up* questions. Filter questions assisted me in determining whether respondents were part of a particular sub-population or not – e.g. filter question posed: 'Are you currently working towards furthering your academic qualifications?'; follow-up question: 'If yes, please specify type of qualification'. *Complete the information* questions were used where the answer variables to the question were too many to contemplate – e.g. 'How many formal lecture hours (including tutorials and lab duties) do you currently have each week?'

Table 3-4: Question format per section of the questionnaire

Section on the questionnaire	Question format (Cohen *et al.*,, 2003, p. 250-255; Schnetler, 1989, p. 46-52, Babbie & Mouton, 2003, p. 242)
Section A	Dichotomous, Multiple choice, Filter and follow-up,
Section B	Multiple choice, Complete the information
Section C	Complete the information, Matrix rating scales, Dichotomous
Section D	Matrix rating scales, Rank order, Multiple choice
Section E	Matrix rating scales, Rank order

Rank order questions were used to identify respondents' relative degree of preference regarding a particular matter. Although rank order question instructions were clearly articulated, especially after pre-test testing of the questionnaires, many respondents still answered these questions incorrectly, and this rendered the use of data less

satisfactory than anticipated. Matrix rating scales were used most frequently in the questionnaire. Matrix formats allow for several questions to be asked with the same set of answer categories (Babbie & Mouton, 2003, p. 242). The categories for the matrix questions were five-point Likert scale categories. The five-point scale allows for a mid-point that eases the interpretation of data since a mid-point is clearly articulated in the question and widely understood by respondents.

Instructions

Instructions on the questionnaire were clearly stated and the clarity thereof verified by a language specialist. This was followed up by pre-testing the questionnaire and adapting questions that were unclear. The questionnaire was compiled in a self-completion format which means that the paper-based questionnaire had sufficient instructions for the respondents to follow on their own. The academic population is well equipped to understand and respond to a self-completion questionnaire.

Language translation and pre-testing

Prior to sending the questionnaire to the total academic population, it was translated into Afrikaans from English, and a language specialist was employed to translate the questionnaire back into English again. This ensured that the questions had the same meaning and interpretation in both languages.

For the pre-test study at campus A, 11 academics, representing different faculties/divisions, job levels and the two main language groups at the institution, were purposively selected to complete the questionnaire as part of a pre-test study. Certain questions in the questionnaire were adjusted to ensure clarity and correct interpretation, following responses from the pre-test group. At campus C, the questionnaire was sent to the campus registrars and, on the basis of their feedback, together with the fact that the questionnaire had already been administered and data analyzed at campus A, no further pre-testing was conducted. At campus B the research dean was instrumental in adapting the questionnaire and it was sent to the four faculty research managers for input. Minor changes were requested and made.

3.4.2 SAMPLING

The study locations were on five campuses of two higher education institutions. The campuses are indicated per institution in table 3-5.

Table 3-5: Study location and sample size per institution

University			Technikon		
Study location	Number of academic staff members	Referred to as	Study location	Number of academic staff members	Referred to as
1. Main campus	411	Campus A	4. Main campus	284	Campus B
2. Satellite campus 1	88	Campus C	5. Business management campus	127	
3. Satellite campus 2	38				
Total	537		Total	411	
Combined total of 948 academics					

The full population of academic staff members at each institution was targeted for the questionnaire (948 academics in total). This was done because of a political consideration (discussed in section 2 of this chapter). The study was therefore a census survey with a self-selected sample. The generalizability of the results of questionnaires is directly influenced by the choice of a census (Babbie & Mouton, 2003, p. 166) and, strictly speaking, only probability (or random) samples can be statistically generalized to the population (Williams, 1997, p. 68). I was aware of this fact but felt that the political consideration carried greater priority and decided to employ alternative strategies in order to increase the response rate. The use of census surveys is similar to non-probability sampling methods in that no indication of the possible bias or error estimates of population parameters can be given (Stoker, 1989, p. 96). Bias in my questionnaires cannot be attributed to my actions or to poor sampling, since every academic had an equal opportunity to respond to the questionnaire. Therefore, there were no subjective actions on the side of the researcher. Any bias in the data of the questionnaire could have been created by the respondents through their choice to answer or disregard the questionnaire. This would

be similar in the case of sampling, since, respondents are still in control of the choice to answer the questionnaire or not, which creates bias.

Population parameters

The population parameters are academic staff members – i.e. those staff members who have teaching or research tasks as part of their normal job duties and are permanently employed by the institution or are employed on full-time contracts. Each academic staff member was therefore a unit of analysis. Administrative staff members were not targeted since academic staff members are the main users of the institutional research management system and are best equipped to provide information on research management. The academic staff members from the different campuses furthermore have varied exposure to formal and informal research management systems at their institutions. Academics on campus C also added diversity in that they had only been part of the university for four months and originated from a previously disadvantaged institution where research was not given the necessary recognition. The different institutions and campuses therefore had great diversity in organizational backgrounds.

Race grouping, which seems like a logical choice for diversity in samples in the South African context, was not used as a manner in which sampling could occur since the legacy of apartheid has made most South Africans want to distance themselves from racial divisions. Staff members on campus A, moreover, were predominantly from a single race group. A biographical question on race grouping was included under the personal information section of the questionnaire for campuses B and C, so that statistical frequencies could be determined and any fundamental difference could be identified via a Chi-square test.

Population frame

Details regarding the academic population of campus A was obtained on an Excel spreadsheet from the personnel office. The spreadsheet contained information such as the title, initials and surname, telephone and office number, department and faculty, as well as the job seniority level of each academic.

The information for the population on campus C was obtained from the campus registrars since the personnel system of the satellite campuses had not yet been integrated with the main campus. The registrars also provided an Excel spreadsheet with the same information as indicated under the main campus.

At campus B, all permission for access to information was obtained and directed through the research dean's office. This office provided me with a spreadsheet with the same information as the university's but also indicated on which campus the personnel were situated.

Since no accurate personnel statistics were publicly available, I had to accept the spreadsheet data provided. I did, however, compare the personnel totals with statistics that were rounded off in the institution's annual reports. This assisted me in verifying whether the numbers provided were, on average, in line with the true academic personnel population.

3.4.3 ADMINISTRATION, DISTRIBUTION AND RETRIEVAL

The different versions of the questionnaire were administered at a time when the three campuses (A, B and C) were not identifying with each other as part of one institution. This meant that I could capture the true differences, and the institutional contexts and histories were retained and could be portrayed separately.

- **Campus A**

A paper-based copy of the questionnaire was made for each respondent. I used an individually addressed envelope for each academic and indicated a due date on the envelope. This assisted in eliminating the possibility that the envelope would be opened after the due date.

Delivery of envelopes to the offices of academics commenced on Friday 5 September 2003 and was completed on Monday 8 September 2003. After delivering each envelope to the office numbers indicated on the spreadsheet, a student assistant assisted me in telephoning each academic department's chairperson to inform him/her of the questionnaire and to request that they encourage their colleagues to complete the questionnaire. In instances where the chairperson was not available, the academics

of that particular department were telephoned directly. A few academics indicated that they would be on sabbatical or absent as a result of other commitments. Notwithstanding the indication of absence, the questionnaire was sent to these individuals in the event that they might find the time to complete it. I trained the student assistant by writing down the purpose of the questionnaire together with the use and report back of data, and had a trial run of possible questions that academics might ask. During the first two days of telephoning, both the student assistant and I worked in the same office so that any questions that were difficult to deal with could be addressed immediately. I handed over the rest of the telephoning to the student assistant once the types of questions that academics asked began to repeat and the assistant indicated that she felt comfortable with the task at hand.

Academics had **three weeks** in which to complete the questionnaire. The return address was indicated on the questionnaire. The majority of respondents made use of the university's internal mail delivery service. I waited another week after the due date to ensure that no mail was delayed in the mail delivery system. Thereafter I forwarded the completed questionnaires to the statistical consultation services so that the data could be captured and statistical calculations done.

Once I obtained printouts of the statistical calculations, I took the returned questionnaires and captured all written comments that respondents had made since these comments were sometimes more telling than the actual numeric data.

- **Campus C**

The questionnaire was sent out to the academics on both campuses (combined as campus C) on 13 April 2004. Questionnaires were placed in individually addressed envelopes and a due date indicated on the envelope. This was done, once again, in order to eliminate the possibility that the envelope would be opened after the due date. Questionnaires were mailed through the internal mail delivery service and I telephoned the mail rooms on each campus to request that the postage bundle be given priority. The same student assistant used for campus A contacted each academic telephonically to inform him/her of the questionnaire and to request completion. I telephoned the campus registrars after one week to enquire about the response rate. Respondents had **two weeks** in which to complete the questionnaire.

Instructions for the return of the questionnaire indicated that respondents had to return the questionnaire to the registrar's office. This ensured that I was able to monitor progress throughout the data-collection period. The registrars forwarded the completed questionnaires to me nine days after the due date. This ensured that all late questionnaires could still be accepted for analysis. I handed the completed questionnaires to the statistical consultation services for data capturing and statistical calculation purposes. Once a printout of calculations was obtained I captured all the written comments that respondents had made.

- **Campus B**

The questionnaire was sent out in a paper-based format to 411 academics on two campuses of the technikon (combined as campus B). I was not as directly involved in the distribution of the questionnaire at campus B as I was at campuses A and C, as a result of the sensitivity around the merger and the fact that I was able to contact academics directly. I placed all the questionnaires in personally addressed envelopes and delivered them to the institution's mail room on 16 March 2004. Respondents had **6½ weeks** to respond to the questionnaire because the research dean insisted on such a long time. Copies of the questionnaire and a cover letter, explaining the importance and use of the data, were placed in internal mail envelopes and sent to the heads of departments, heads of schools and the deans on all of the campuses. Furthermore, an 'all users' email message was sent from the dean of research's office, to encourage participation in the survey. The faculty research managers coordinated the return of completed questionnaires to their offices and mailed them back to my office through an inter-institutional mailing system. I telephoned the faculty research managers on 19 April 2004 to determine the response rates and encourage participation.

I forwarded the completed questionnaires to the statistical consultation services at my institution for data capturing and statistical calculation. Once I received a printout of the calculations I captured all the written comments that respondents had made on the questionnaires.

3.4.4 RESPONSE RATE AND REPRESENTIVITY OF RESULTS

The response rate is indicated in table 3-6. Non-respondents were not used to control the responses as the survey was anonymous and the control group would lose their anonymity if requested to serve as control for the data.

Table 3-6: Response rate

	Campus A	Campus C		Campus B	
		Campus 1	Campus 2	Main campus	Business campus
Number of respondents	204	44	20	76	17
Number of academic personnel	411	88	38	284	127
Response rate per campus	49.6%	50%	52.6%	26.7%	13.4%
Response rate per campus	49.6%	50.7%		22.6%	

Babbie and Mouton (2003, p. 261) indicate that an acceptable response rate for a self-completion mail survey is 50%. The response rate on campus B was significantly below 50%. The interest in the survey topic will affect the response rate (Williams, 1997, p. 73) and therefore the low response rate says something about the importance that academics at campus B attach to research matters. The research dean predicted a low response rate due to low levels of research activity at the institution. I did however indicate, on the cover letter of the questionnaire, that I was interested in academics' opinions about research even if they were not research-active. There were no reported problems with the distribution, administration or retrieval of the questionnaire at any of the campuses. Nevertheless the response rate was above 20% and the demographic groupings that responded were proportionate to the demographics of the academics of campus B. Furthermore, 51% of respondents on campus B indicated that they had 'some to full-time' research responsibilities, on the basis of which the assumption could be made that 51% of the respondents were knowledgeable about research, and could therefore comment authoritatively on the topic of research. Based on the aforementioned, the data was used for comparison purposes. Campus A's response rate was 49.6%, which is seen as in line with the 50% requirement of Babbie and Mouton. For campus A and C the response rates represent

half of the academic population for each campus. A discussion of the actual results with proportionate demographics is presented in chapter 4.

- **Combination of campus data**

Since both the satellite campuses of the university belonged to the same previously disadvantaged institution prior to their integration into the university, and they had only been formally integrated into the university for 4 months at the time when the survey was administered, I combined their data for analysis purposes. Their data is reflected as campus C and analyzed as though it were a single campus – separate from the university's main campus (campus A).

The main and business campuses of the technikon were combined for inter-institutional comparisons since the response rate from the institution overall was low. Combining the data of the two campuses of the technikon furthermore provided me with three sets of data – i.e. campuses A, B and C, all of which have very different backgrounds regarding research matters.

- **Strategies to improve the response rate**

I made use of a strategy of telephoning individual academics at campuses A and C to solicit their participation. This did result in good response rates. Furthermore, academics were given a maximum of 3 weeks and two weeks, respectively, in which to complete the questionnaires. This ensured that they were given sufficient but not too much time. At campus B, as a result of pressure from the research dean, the academics were given 6½ weeks in which to complete the questionnaire. This was too long and I have concluded that more time does not necessarily result in higher response rates. Moreover, at campus B I was not permitted to telephone academics directly, which in the case of campuses A and C assisted in increasing the response rate.

3.4.5 INFORMED CONSENT

Although permission to conduct the research was obtained from both institutions, academics, as the unit of analysis, had to give informed consent before they answered the questionnaire. Each questionnaire had a cover page explaining exactly what was to be done with the information and the fact that the questionnaire was anonymous. Consent to disseminate information obtained from the quantitative phase was constantly renegotiated according to the intensity of the merger negotiations. Academics did receive feedback on the results of their data via an electronic message that was sent out to them, indicating where they could download a printable version of each of the reports.

3.4.6 QUANTITATIVE DATA ANALYSIS

Analysis is the interpretation of the data collected for the purpose of drawing conclusions that reflect on the interests, ideas and theories that initiated the inquiry (Babbie & Mouton, 2003, p. 101). The quantitative analysis was initially based on the parcels of the theoretical model, depicted in figure 3-3. A second model, namely an empirical model, was derived from a factor analysis. Both models were tested for reliability. Both the theoretical and empirical models were thereafter used to determine which parcels/factors have the highest prediction rate for the dependent variable 'research output'. This was done via one-way ANOVAs, CHAID and regression analyses. Furthermore, Chi-square tests were conducted. Data was managed on the SPSS statistical package and calculations done by statistical consultation services. Statistical results are provided in chapter 4 under three headings: descriptive statistics, factor analysis and reliability, and inferential statistics. Next, the tests and analyses are discussed under these headings.

- **Descriptive statistics**

Descriptive statistics are the responses received per item on the questionnaire and describe what the data looks like – e.g. the mean, median and mode (Leedy & Ormrod, 2001, p. 259). Overall, the questionnaire contained 117 items. Of the 177 items, 72 items were used for the purposes of theoretical and empirical model calculations. The remaining number of items that were not used during calculations contained information that the management of the two institutions specifically

requested for institutional management purposes. Information contained in these items was from the personal information (section A) and working conditions (section B) sections of the questionnaire. Specifically with reference to the working conditions, questions between the different campuses differed considerably as a result of institutional differences and therefore comparison would be unsuccessful.

- **Factor analysis and reliability**

Reliability calculations will be utilized in order to determine the reliability of the parcels of the theoretical model and the factors of the empirical model. Reliability is measured through a numerical coefficient of reliability called the **Cronbach alpha** (Santos, 1999, p. 1). Cronbach's alpha measures how well a combination of items, such as the items grouped into a theoretical parcel or an empirical factor measures a single unidimensional latent construct, such as the title of the parcel/factor (UCLA, 2005, p. 1). Huysamen (1996 cited in Wolfaardt, 2001, p. 46) suggests that the reliability coefficient should be 0.85 or higher if measures are used to make decisions about individuals, while it may be 0.65 or higher for decisions about groups, although, for basic research the guideline is 0.55 (Nunnally & Bernstein, 1994).

A **factor analysis of variance** reduces all the items of a questionnaire into smaller sets of variables that account for most of the variation amongst respondents, using the data as a whole (Howell, 1999, p. 335). Factor analyses are useful to determine whether the data obtained from respondents presents another model through a different set of factors, or confirms the theoretical parcels in a theoretical model. Before a factor analysis can proceed, two tests should be done – namely, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The two tests determine whether the item inter-correlation matrix is suitable for a factor analysis. The KMO measure of sampling adequacy should be 0.50 or higher and Bartlett's test of sphericity should be statistically significant (UTexas, 2005, p. 4). These tests are repeated throughout the levels of the factor analysis by starting off each level with item inter-correlations.

During the factor analysis the *first level analysis* will utilize the Principal Axis Factoring Extraction method utilizing the Varimax Rotation with Kaiser Normalization. Eigen values are calculated and represent the sum of variances of the

factor analysis (Cooper & Emory, 1995, p. 539). Eigen values should be larger than 1 for factors to be postulated. The *second level analysis* starts with the calculation of sub-scores for the postulated factors derived in the previous level. An Anti-image correlation indicates whether the KMO is adequate and Bartlett's test is conducted again. Factors that do not meet the KMO of >0.50 are discarded. Eigen values are calculated on the inter-correlation matrix of the remaining sub-scores. For the second level factor analysis, a Principal Axis Factoring Extraction method utilizing the Oblimin with Kaiser Normalization is conducted. The process is repeated until all variance is accounted for.

- **Inferential statistics**

Inferential statistics allow us to make inferences about large populations (Leedy & Ormrod, 2001, p. 259). The factor analysis, reliability testing and inferential calculations are done in order to reach the objectives of the quantitative phase of the study, namely (1) to determine which factors, as identified in a literature study as well as through a factor analysis, were predictive of the dependent variable 'research output'; and (2) to determine whether these factors differ according to age, gender, experience in and outside of higher education, job seniority level, and academic discipline. The different tests and analyses that were utilized for my study are discussed next.

- Chi-square tests

Statistical analysis of data was conducted by cross-tabulating the frequencies recorded under each item and conducting **Pearson Chi-square** ($\chi^{2)}$ tests as well as **Cramer's V coefficient** (V). The Chi-square goodness-of-fit test determines how closely observed frequencies match expected frequencies, and can be computed for nominal, ordinal, interval or ratio data (Leedy & Ormrod, 2001, p. 278, Mason *et al.,* 2002, p. 512; Howell, 1999, p. 373). As a result of the low response rate from campus B, Cramer's V coefficient test was used since it is not affected by sample size or response rate and "...is useful in situations where you suspect a statistically significant chi-square was the result of a large number of responses instead of any substantive relationship between the variables" (AcaStat Software, 2005). The Chi-square tests were conducted firstly to show significant differences between campuses. Secondly, Chi-

square tests were conducted on the combined data of campuses to show whether demographic variables have an effect on the dependent variable 'research output'.

- One-way ANOVA

For the theoretical model, one-way analysis of variance using a single theoretical parcel as predictor of research output was conducted, first by means of Chi-square tests (as explained above) and then through a one-way ANOVA. These tests provided answers to all of the objectives of the quantitative phase of the study. ANOVA uses squared deviations. The mean of each theoretical parcel as well as the values that deviate from the mean are calculated. A grand mean is calculated for all the means and the total deviation is the sum of the squared differences between each data point and the overall mean. In the ANOVA an F-ratio is calculated by calculating the variance between-groups and within-groups. If the null hypothesis is true, the F-ratio should be close to 1 (Howell, 1999, p. 300).

- Prediction models

In order to determine which parcels/factors of both the theoretical and empirical models were predictive of the dependent variable 'research output', a CHAID as well as a regression analysis were conducted. On the basis of these analyses and after further reliability calculations via Cronhach's alpha, a theoretical research output prediction model and an empirical research output prediction model were derived. Both the CHAID and regression analyses do the same work but the CHAID analysis was followed by a nominal logistic regression analysis because of the low n-count and in order to verify the outcome of the CHAID analysis. The CHAID and binary logistic regression analyses are discussed next.

- CHAID analysis

A **Chi-squared Automated Interaction Detector (CHAID) analysis** is an exploratory method to study the relationship between a dependent variable (research output) and a series of predictor variables (QuestionPro, 2005, p.1), such as the theoretical parcels or empirical factors. The CHAID analysis provides a one-way prediction value based on multiple factors (or theoretical parcels). CHAID modelling selects a set of predictors and their interactions that optimally predict the dependent

variable. The result is a diagram that illustrates the predictor variables and also includes missing values.

- Binary logistic regression analysis

A **binary logistic regression analysis** using 'Research output' as the dependent variable was conducted. Logistic regression is a statistical tool for modelling the relationship between a response variable and a set of explanatory variables (UKY, 2005, p. 1). A binary regression analysis was used since research output was collapsed into two categories because there were only 157 valid items. The analysis was conducted using a Forward Stepwise (Wald) statistical analysis, where at each step the variable that minimizes the overall Wilks's Lambda is entered. Stepwise procedures are a set of rules for deriving a regression equation by adding or subtracting one variable at a time from the regression equation (Howell, 1999, p. 211). The basic procedures involve: (1) identifying an initial model – in the case of my study, in separate analyses, two models were used, namely the theoretical and empirical models; (2) iteratively 'stepping' – that is, repeatedly altering the model at the previous step by adding or removing a predictor variable in accordance with the 'stepping criteria'; and (3) terminating the search when stepping is no longer possible given the stepping criteria, or when a specified maximum number of steps has been reached (Statsoft, 2003, p. 6).

In summary, all of the above statistical calculations and analyses resulted in:

- Refining of the theoretical model;
- Defining of an empirical model;
- Determining which factors in each of the above models were predictive of the dependent variable 'research output';
- Determining which demographic factors in a one-way analysis were predictive of the dependent variable 'research output'; and
- Determining differences between campuses for factors such as age, gender, experience in and outside of higher education, job seniority level, and academic discipline.

3.4.7 REPLICABILITY AND RECORDING/STORAGE OF DATA

The study can be replicated since all the steps and actions are clearly recorded in this thesis and supported by field documentation. The field documentation includes copies of the distribution lists, telephone call information, follow-up information, statistical calculations and results as well as three reports in which the results are summarized and discussed. Electronic data is stored on hard disk and CD.

3.4.8 SECONDARY DATA – DOCUMENT ANALYSIS

In order to verify certain data of the questionnaires I conducted document analysis in order to find corresponding statistics. Another reason for document analysis was that there were no centralized statistics available at any one of the institutions that I could use to inform issues such as the research output of individuals, their level of professional activities, etc.

I requested copies of the annual reports, from 1999 onwards, of all the faculties from the two institutions. I obtained the institutional reports immediately from the technikon. They did not give me access to their faculty-level reports, however. I did receive copies of the annual reports of the dean of research, which was very helpful in summarizing research-related information for the institution.

The university annual reports were more difficult to obtain. The Faculties of Business and Management Science and Science gave me immediate access to their reports. The annual reports were not compiled in the same format, nor did they contain the same types of data or the same level of detail. The other faculties did not give me direct access and a faculty requested that I should not remove the annual reports from their offices. Other faculties did not comply with my request at all. I received immediate access to the institutional annual reports but found them to be very superficial, with very little information that could be used for comparison purposes.

In conclusion, I was not able to use any of the data found on the university documents to support or reject questionnaire results. Information found in the annual reports by the technikon's research dean was used to verify data obtained through campus B's questionnaire.

QUALITATIVE PHASE

The qualitative phase of the study commenced during April 2004 with planning for the execution of interviews. The qualitative phase focused on senior management members who are directly involved in research management at the two institutions. A conceptual schedule was used in the execution of interviews (refer to section titled 'Field notes' figure 3-4).

Twelve (12) individual interviews with deans and managers involved directly at institutional level in managing research were conducted. Eight follow-up interviews were conducted. Interviews were conducted from April to May 2004. The interviews were tape-recorded, transcribed, analyzed using Atlas.ti and presented in networks. Follow-up interviews were held during August 2004 in order to validate the networks. A presentation of interview data, after analysis, was done in a fourth and final report that was sent to interviewees and to all the middle and junior managers at both institutions. Feedback and comments based on the reports as well as an analysis of the most recent policy documents that have emerged since the beginning of 2005 also served to validate findings.

3.4.9 DATA-COLLECTION METHOD – UNSTRUCTURED INTERVIEWS

The purpose of any qualitative research project guides the choice of the available research approach. The four purposes are description, interpretation, verification or evaluation (Peshkin, 1998, cited in Leedy & Ormrod, 2001, p. 148-149). My study's purpose is both descriptive and interpretive in nature, since I wanted to identify the factors that influence a productive research environment (tangible and intangible) at institutional level at two merging higher education institutions (descriptive). Furthermore, I wanted to determine the interactions between the tangible and intangible factors as well as determine the levels of research management with corresponding purposes and interaction (interpretive). In order to achieve these purposes I chose unstructured interviews with a schedule as the research method (Schurink & Schurink, 2003, p. 3).

Unstructured interviews with a research schedule give us the opportunity to understand experiences and reconstruct events in which we did not participate, and are especially useful in social and political processes. The research schedule that is used during the interview process "...is a guideline for the interviewer and contains questions and themes that are important to the research" (Schurink & Schurink, 2003, p. 3). The research schedule does not dictate questions, sequence, process or themes. Instead it is used as a tool to ensure that the research agenda or purpose of the interview is covered. During interviews my level of control over data was very low since the emphasis was on rapport, trust and participation as measures of establishing validity in the study (Babbie & Mouton, 2003, p. 77). Although an interpretive approach was followed which ensured that my pre-determined categories or pre-empting thoughts did not contaminate the interview process, I did use a pre-determined conceptual framework to guide the questioning process (i.e. a research schedule). This model ensured that I covered the full range of open-ended questions to fully cover the topic under discussion, thereby ensuring validity. The schedule was a practical guideline and not based on theory.

Kvale (1988, cited in Miles & Huberman, 1994, p. 35) states that the interviewer, together with the interviewee, 'co-authors' the data during an interview. I co-authored the data by summarizing and reflecting on what the interviewee was saying, thereby interpreting the meaning that the interviewees gave to their data. This ensured that I captured their meaning accurately and it kept the interview semi-structured and focused.

Although the unit of analysis was the combined senior management group from both institutions I aimed at constructing, through the interview data, a combined reality of the factors that influence a productive research environment at institutional level for the merged university. As this is a study that provides a 'snap-shot' of an institution at a particular moment in time, I attempted constructing a system that represents the factors that influence research at institutional level for the present time. The combining of qualitative data in this manner is supported by Needham (1981, p. 68, cited in Fielding & Fielding, 1986, p. 97) who states that ". . . it is not merely analysis into minimal constituents that counts . . . but what can be made of their synthesis".

3.4.10 FIELD NOTES

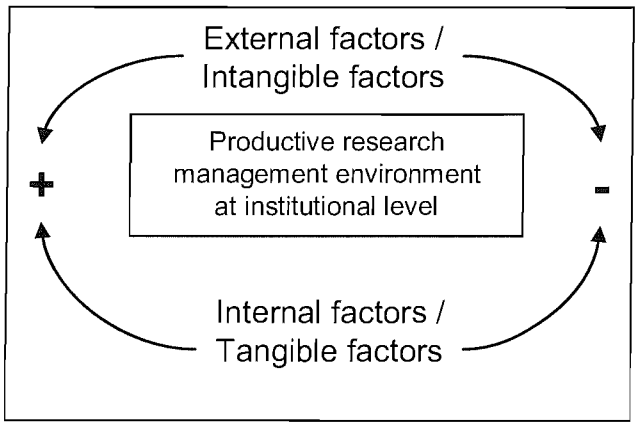


Figure 3-4: Schedule to guide interview questions

The main purpose of the qualitative phase was to identify the factors that influence a productive research management environment at an institutional level. A university is influenced by factors internal to the institution as well as factors external to the institution. The schedule (illustrated in figure 3-4) guided the questioning process during the interviews to ensure that both internal and external factors are probed – and also positive and negative factors.

My field notes consisted of the three types suggested by Schatzman and Strauss (1973, p. 99-101 cited in Schurink, 2004a, p. 18). They are observational notes, theoretical notes and methodological notes. Bogdan and Biklen (1998) also suggest that field notes should contain reflections on analysis, method, ethical dilemmas and a researcher's frame of mind. The framework for my observational notes was based on the schedule (refer to figure 3-4) but also included information about the interview setting and any interesting points that I noted about the behaviour and actions of the interviewee. For example, one interviewee closed the interview with the following remark: "Thank you for the interview. We are friends aren't we Anita?"

My theoretical notes, which are ". . . self-conscious, systematic attempts by the researcher to derive meaning from some or all observational notes" (Schatzman & Strauss, 1973, p. 99-101 cited in Schurink, 2004a, p. 18) are various drafts of reports and chapters and the final thesis. Other theoretical notes were also made on the

electronic data capturing package Atlas.ti. I made methodological notes in two books and a file. The methodological notes dated as far back as the first meeting with the university management team.

3.4.11 PARTICIPANT SELECTION

All the existing academic and management staff at each of the institutions remained in similar positions at the merged university and therefore it is reasonable to argue that the factors that influence research at each of the separate institutions will, by and large, be carried over into the merged institution. This means that in all likelihood the current managers will continue to manage research for the merged university for at least an interim period of one year and they will therefore be the new policy formulators. Given this, the senior management directly involved in research management at both institutions was targeted for interviews. The senior management included 11 deans and one vice-rector. The initial interviews covered all subject areas in both institutions (see table 3-7). Initial interviews were between one to two hours in duration. One of the interviews was three hours long.

Follow-up interviews were between 30 minutes and an hour in duration. The purpose of the follow-up interviews was to validate the data presented in networks. The follow-up interviews were conducted at a stage when the interim council for the merged university was busy selecting people to fill the interim management positions and some individuals felt insecure about sharing information. During the follow-up interviews I could see a positive convergence of thoughts around the topic of research management. This was due to the meetings that the deans had on this topic and two deans indicated that they had found my interview helpful in ordering their thoughts about research management. The three initial reports had also been distributed by the time of the follow-up interviews and deans had given their input to interpretation and changes to me.

Table 3-7: Interview list

	University	Technikon	Follow-up interview
Faculty of Arts (and Humanities)	1	No equivalent	1
Faculty of Art Design and Architecture	No equivalent	1	1
Faculty of Law	1	No equivalent	None
Faculty of Engineering	1	1	1
Faculty of Nursing and Education	1	No equivalent	1
Faculty of Economic and Management Sciences	1	1	1
Faculty of Science	1	No equivalent	1
Faculty of Health Sciences	No equivalent	1	None
Vice Rector of Research and Research Dean	1	1	2
Total	7	5	8
Total number of interviews conducted	20		

Eight follow-up interviews were conducted. I did not have a follow-up interview with the Faculty of Law since the dean had resigned. The Faculty of Health Sciences indicated that the dean had a very tight schedule (which included international travel) for three months, and could not accommodate a follow-up interview. The dean of the Faculty of Engineering at the university did not respond to requests for a follow-up interview because of intense negotiations and severe sensitivity around the integration of the two engineering faculties. The dean of Management Science at the technikon did not agree to a follow-up interview and no reason was given. In all of the above instances where no follow-up interview was held, I made a special effort to request that these individuals, bar the Faculty of Law, provide me with feedback on the fourth report. One dean indicated his willingness to do so but did not give any feedback. All individuals did have an equal opportunity to validate findings, which were presented in the fourth report.

3.4.12 OBTAINING ACCESS TO SUBJECTS

At the university I requested the initial interviews by telephoning secretaries to schedule appointments. I presented the request under the auspices of the university's management team and the merger activities. In two instances I was met with an initial unwillingness to grant an interview and I had to request that the vice-rector at the university send an email message, which I compiled, indicating the purpose of the interview and the use of the data.

At the technikon the dean of research presented the need for the interviews to the other senior managers at one of their meetings. After receiving the go-ahead from the research dean I contacted their secretaries and made appointments.

3.4.13 ENQUIRY PROCEDURES

3.4.13.1 The first interview

At each interview I explained the purpose of the interview and requested permission that, once the data had been verified, it could be published in a report for use by the merger task teams. I also requested permission to use the data for my PhD thesis. I explained that the interview data would be analyzed qualitatively and I requested that interviewees share their own experience regarding research management and research activity in a discussion with me. I audio-taped all the interviews after permission was obtained. At no stage during any of the interviews did any interviewee request me to shut off the tape recorder. This indicated that the interviewees trusted me with their data.

Open-ended questions were used throughout interviews to ensure that interviewees were not guided to reach any foregone conclusions. Interviewees were asked what they regarded as helpful/facilitative as well as obstructive to research at their institution.

The question that was posed to all interviewees was:
"In your opinion what factors stimulate research at this higher education institution?"

This was followed by moving through the schedule (figure 3-4) with questions such as:
"What factors internal to the institution stimulates research?"
"What factors external to the institution impedes research?"
and so on.

Probing questions summarizing what they had said, such as:

"You have spoken about many 'hard' issues such as funding. Are there any 'soft' issues that have an influence on research at this institution?" ensured that they spoke about tangibles as well as intangibles.

Each interview was concluded by thanking the participant for his or her time and indicating that a follow-up interview would be scheduled to verify data. Interviewees were also invited to contact me to share any other thoughts that they had after the interview.

3.4.13.2 The follow-up interview

During the follow-up interviews I presented each interviewee individually with a systemic diagram of the combined findings from the interviews. Moreover, I spoke about their specific interpretation of the network, which could easily be extrapolated because of the functionalities of Atlas.ti, and I asked whether the other aspects that were indicated in the network were in line with their thinking regarding the factors that influence a productive research environment at institutional level. The majority of participants contextualized and elaborated on their data. Code names that I had assigned to certain factors were challenged and changed in response to the second interview process. The follow-up interviews were audio-taped and for each feedback interview I compiled a presentation pack which included a list of the code names that they had used, a copy of the network and the results of the quantitative questionnaire pertaining to their faculty. During the interview I made notes on the presentation pack. One interviewee requested an electronic copy of the pack, which was supplied.

3.4.14 RECORDING OF DATA

Twelve initial interviews were audio-taped and extensive observational notes were made. The audio-tapes were transcribed and converted into the Atlas.ti qualitative analysis software (Muhr & Friese, 2004). As already indicated, Atlas.ti was used as a database to manage the transcriptions of the interviews and theoretical notes, as well as to store my analysis information.

During follow-up interviews detailed observational and theoretical notes were made and the interviews were tape-recorded. Data on Atlas.ti was updated from these paper based and audio notes. A backup system was created by keeping all written material

organized in files and all electronic information stored on CD. This ensured that documents were safeguarded.

3.4.15 QUALITATIVE DATA ANALYSIS

Analysis of data was conducted manually using the Atlas.ti computer package as database. The electronic functionalities of the programme eased the support of large datasets and supported the analysis procedure followed. The Miles and Huberman 'transcendental realism' analysis approach, which is "...directed at tracing out lawful and stable relationships among social phenomena, based on the regularities and sequences that link these phenomena" was followed (Miles & Huberman, 1994, p. 4, cited in Punch, 1998, p. 202). The analysis approach is based on pragmatism as well as critical theory, which both have qualities of interpretivism as well as post-positivism. The analysis approach that was followed included a good deal of order and formalization together with the interpretation of meaning (Miles & Huberman, 1994). Order and formalization was given by conduct in three phases, namely data preparation, data analysis and data verification. The data analysis and data verification phases were repeated a few times during the clean-up process of data on Atlas.ti and after the follow-up interviews. This section will be discussed according to these phases.

- **Data preparation phase**

Data was prepared for analysis by transcribing the audio-tapes into MS Word format. The MS Word documents were converted into 'text only with line breaks'. The text only documents were thereafter imported into the Atlas.ti programme as Primary Documents. Each Primary Document received a computer-generated number (e.g. P1). I created Primary Document families on Atlas.ti so that I was able to identify the Primary Documents of the university and those of the technikon and this action later on facilitated the ability to conduct selective data retrieval.

- **Data analysis phase**

> *"... it is clear that analysis generally means different things to different people. While there are many ways to undertake the analysis of qualitative data it basically involves data reduction, data display, conclusion drawing and verification. Closer viewed, analysis involves working with data,*

organizing them, breaking them into manageable units, synthesizing them, searching for patterns, discovering what is important and what is to be learned, and deciding what to tell others."

(Schurink, 2004a, p. 98)

In order to explain the process that I followed in analyzing the data, I shall start at the end-product of my analysis, namely networks. Three networks were distilled from the interview data. The networks were created with the study's main research questions being kept in mind and therefore factors that influence a productive research management environment at institutional level were identified and placed into networks to illustrate their dynamics and interaction. Each network is made up of codes and their relations (or interactions with each other). Codes and their associated relations were created using the process illustrated in figure 3-5.

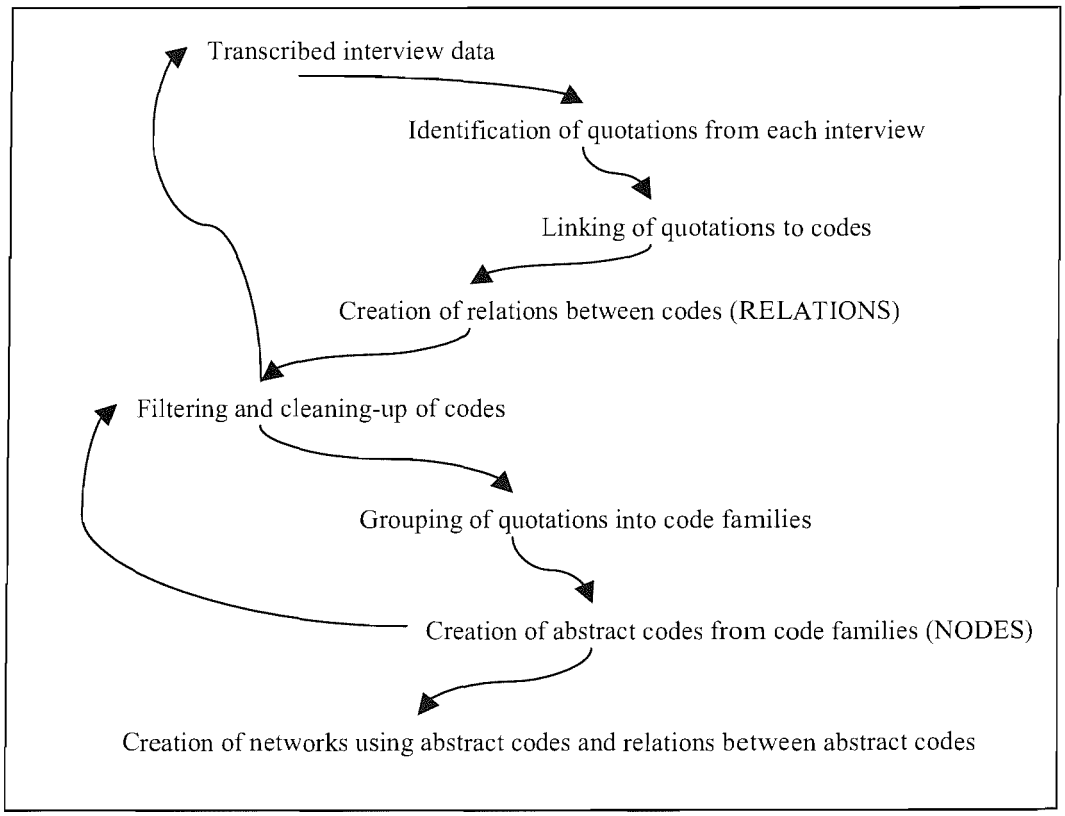


Figure 3-5: Process of data analysis

The Miles and Huberman transcendental realism analysis approach, which I followed, is not as highly structured as the grounded theory analysis approach although it is based on the creation of a conceptual framework that is used to guide data analysis. Figure 3-6 presents my conceptual framework to guide analysis. The interview

schedule items were derived deductively but the analysis that followed was primarily done inductively (also called the constructive or generative approach) (Miles & Huberman, 1994, p. 155).

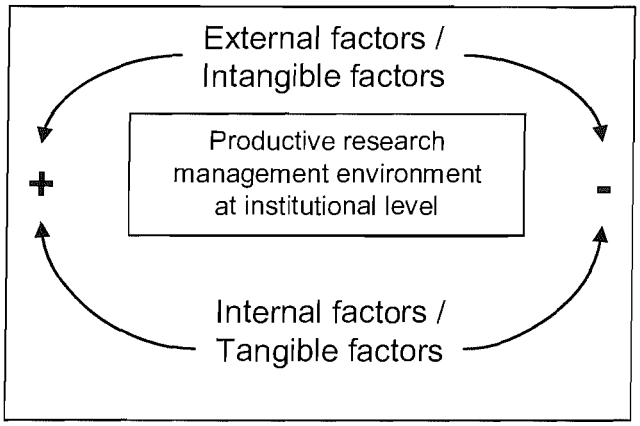


Figure 3-6: Conceptual framework to guide data analysis

Following the process outlined in figure 3-5, after quotations that match the research question are identified, a code is assigned to the quotation. Codes were assigned through in vivo coding, where the exact word(s) on the transcript is used as a code, through the creation of new codes that I assigned to the quotation and eventually by making use of the list of quotations that had developed as the analysis progressed. Miles and Huberman refer to the initial coding of such small chunks of data, with less regard to setting or the passage of time and sequence, as analysis in the variable mode (1994, p. 147).

I was searching for positive and negative factors that were internal and external or tangible and intangible to the organization. I did however, loosely base my coding procedure on the data-analysis procedure of grounded theory (Strauss & Corbin, 1999, 1998 cited in Leedy & Ormrod, 2003, p. 154-155). I initially started with open coding, where data was scrutinized for commonalities that reflect categories or themes in the data. These categories explained themes such as funding, or postgraduate students, which appeared as factors that influence a productive research environment at an institutional level. Axial coding, where interconnections are made among the categories (codes), was done next. I used axial coding to determine more about the different codes in terms of the context in which they are embedded (e.g. culture differences between the technikon and university), the strategies that people use to

carry out the code (e.g. management tools) and the consequences of those strategies (i.e. code relations). Miles and Huberman refer to process mode analysis, where chronologies are assembled and the analyst looks for connections in the big picture (1994, p. 147).

Atlas.ti allows one to establish relations between different codes in order to more clearly express the nature of the relationships between code concepts. The relation types are displayed in a network figure, midway between the two connected codes, and are illustrated as a symbol, or wording, attached to an arrow or line. Relation types are indicated in figure 3-7. Code relations are directional rather than correlational or causational (Miles & Huberman, 1994, p. 153).

[ ] – Code is *'part of'* another code, meaning that the relevant code could be collapsed under another code of which it forms part. The codes that form part of another code can therefore cascade from a 'main' code of which it is part.

[= =] – Code is *'associated with'* another code, meaning that the relevant code is not a part of the other code, but is closely connected sharing a common theme or connection with the relevant code.

[determinant of] – Code is *'determinant of'* another code, meaning that a relevant code directly shapes and moulds the outcome of another code and is therefore a key element in the state of the other code. It is transitive in nature, meaning that if the relation holds between the first code and the second, and between the second code and a third code, it holds between the first and third codes.

[results in] – Code *'results in'* another code, meaning that the relevant code arises as a consequence, effect or conclusion of another code, and has a specified outcome or end.

[S] – Code *'supports'* another code, meaning that the relevant code is neither a direct cause nor a result of another code, but instead promotes the interest of, and thereby maintains, another code.

[influence] – Code *'influences'* another code, meaning that the relevant code is neither a key determinant, nor a result of another code, but has the power of causing or producing an effect on a code in indirect or intangible ways, thereby potentially exerting some influence in a positive or negative manner.

[directs] – Code *'directs'* another code, meaning that the relevant code follows a straight course without any intervening agency, thereby indicating an authoritative relation.

Figure 3-7: Code relation types

The last part of my coding procedure was to do selective coding where codes and their interrelationships are combined into a story (i.e. a network), and this presented a visual model that could be used to explain the factors that influence a productive research environment at the merged university.

Following coding is the filtering and clearing up of codes. This forms part of the verification process. I collapsed codes into other codes where there were duplicates and in other instances renamed codes. This process was facilitated by printouts of code lists, field notes and memos.

After the filtering of codes, I created abstract codes and code families. Abstract codes are formed where there is a logical grouping of codes, sometimes referred to as a code family, into a higher level of abstraction than the individual codes. In creating the networks, the majority of codes presented are abstract codes. Memoing took place as thoughts occurred to me, arising from the coding process. These memos were numbered and named and I followed up any outstanding memo questions during the follow-up interviews.

- **Data verification phase**

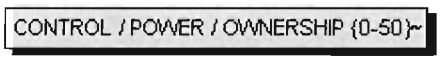
Verification occurred throughout the analysis process and also during the follow-up interviews. A way of dealing with validity and reliability is to use extensive field notes (Bogdan & Biklen, 1998; Babbie & Mouton, 2003, p. 275; Schurink, 2004a, p. 18). My verification was facilitated by field notes such as observational and theoretical notes on both sets of interviews as well as my own memos. The verification process ensured that data on Atlas.ti contained the same meaning as given by the interviewees.

- **Ensuring rigour**

The rigour of the analysis process is demonstrated in the networks, where each code in the network is followed by numbers in brackets, e.g.:

The code name is 'Subject disciplinary differences'. The first number, in brackets, following the code name, indicates *groundedness.* In the above example there are 20 quotations that are linked to this code. The second number following the dash indicates *density.* In the above example there are 11 other codes that are linked to this code, indicating that the code is dense. Each of these 11 associated codes has its own quotations linked to it. The tilde [~] denotes that the code has a comment and this code comment is used to explain the meaning of the code at the beginning of each section where the code is discussed.

Some of the codes or abstract codes in the networks seemingly have no quotations linked to them, as is the case with the example below:



The above code 'Control/Power/Ownership' is an abstract code that was derived by combining fifty other codes into this code. The density of the code is therefore clear; however, the groundedness is not clear from the numbers in the network but is evident from the code density as well as the description of codes (provided in the footnotes to the text in chapter 5).

Careful attention was spent during data analysis to ensure that quotations were both *grounded* (code frequency i.e. number of quotations to which a code is applied or number of quotations linked to a specific code (Muhr & Friese, 2004, p. 55)) and *dense* (number of other codes linked to a specific code (Muhr & Friese, 2004, p. 55)). As a result of the phenomenological nature of interpretation of the data, codes are not numerically equal (comparable) in their groundedness or density. Seeking to statistically compare and equate data is not the intention of interpretive analysis, which seeks instead to present data as the participants (interviewees) explained it, and not to statistically generalize findings. Therefore some codes will seem 'stronger', or more grounded and dense, than others. However, the seemingly 'weaker' codes form an integral and equally important part of the presentation of the networks, as they too emerged from the interview data. I have therefore not indicated how many interviewees supported or did not support a particular code, but have indicated the code groundedness and density for each code mentioned.

As previously mentioned under 'Quality control', the findings of the qualitative study were compared with the findings of the quantitative study, and this included a comparison of factors derived in both phases of the study.

In summary, the above qualitative analysis resulted in:

- Determining which factors influence a productive research management environment at institutional level at the merging institution and illustrations of these factors and their interactions in network diagrams.
- Identifying both the tangible as well as the intangible factors that influence a productive research management environment at institutional level at each of the two merging higher education institutions as well as an illustration of these factors in network diagrams.
- Determining the interactions between the tangible and intangible factors.
- Determining the levels of research management as well as their corresponding purposes and interaction.

3.4.16 TRANSFERABILITY OF FINDINGS

The findings of the qualitative phase of this study are only directly applicable to the merged institution that was investigated. Some of the findings might be applicable to other institutions if further research is conducted through multiple case studies or quantitative measures.

Section 5

3.5 CRITICAL ASSESSSMENT OF THE STUDY

The overall research design is deemed to be appropriate in addressing both the purpose and objectives of the study. Through the quantitative phase the strength of association between variables of a theoretical as well as an empirical model could be determined. A theoretical model that is grounded in theory, based on a literature study, was tested. Furthermore, all academics at the two institutions were provided with an opportunity to voice their opinions regarding research matters. The qualitative phase permitted an understanding of the interrelationship and interaction of various factors that influence a productive research environment. This phase assisted in building theory rather than testing it, which was the case in the quantitative phase. The qualitative phase furthermore allowed for an understanding of the perspectives of senior management within the context of the merging institution, without imposing preconceived models or presuppositions of the researcher on the participants.

A difference in sampling approach for the quantitative phase could have resulted in the ability to fully generalize findings for the technikon (campus B). However, the sampling method, i.e. self-selected sampling through a census survey, was chosen as a result of political considerations in relation to the merger and in this regard was highly appropriate. The low response rate at campus B was therefore not a design error but a consequence of the actual outcome of the study. Generalizability, however, is not necessarily of concern, while replicability is (Miles & Huberman, 1994, p. 144). The study cannot be generalized to other contexts but can be replicated as a result of detailed recording of data and methodology.

The inclusion of academic staff members in the qualitative phase could have added additional richness to the networks that are presented in chapter 5. The current reflection of the networks might have been tilted towards the world of an academic as opposed to the current reflection of the world of a senior manager. With this said it is important to note that only one of the twelve senior managers interviewed had no research experience or record. All the other managers therefore had a good understanding of the needs of academics as researchers. The inclusion of academic

voices through the quantitative phase was therefore deemed appropriate and sufficient.

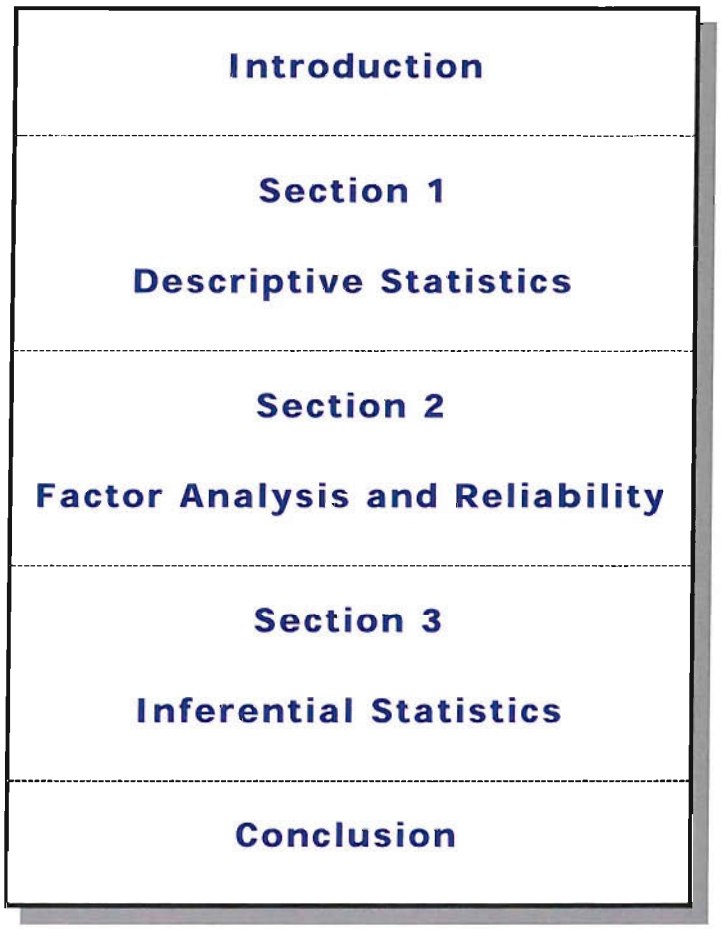
Conclusion

In this chapter research paradigms were discussed and reasons for the choice of mixed methodology explained. The context of the study is explained in order to further support the choice of mixed methodology. The research design, namely a case study and the two phases from which the study is comprised, are explained. The section on the practical execution of the study highlights the pragmatic flow of the study as well as the empirical rigour associated with the execution of data collection and analysis. The chapter is concluded with an assessment of the study's success in achieving what it set out to do methodologically as well as in the attainment of research objectives.

CHAPTER 4

Quantitative Results

Layout of Chapter 4



Introduction

This chapter focuses on the results of the quantitative phase of the study. The chapter does not contain a discussion of the data as this is reserved for chapter 6. Results will be presented highlighting major trends and issues of significance in response to the study's research questions. Appendix I contains copies of the actual questionnaires that were administered and Appendix II provides a comparison of the three sets of questionnaires for the:

1. University main campus (campus A);
2. Technikon campuses (campus B); and
3. University satellite campuses (campus C).

Questions from the three questionnaires were standardized and renumbered as indicated in Appendix II. Certain questions on the questionnaires were not used for purposes of the PhD since the questionnaires served a double purpose. The first purpose was associated with the PhD and the second purpose related to collecting management information for the case institutions.

The chapter is divided into three sections. It commences with the results of the descriptive statistics, provided separately for each campus. The presentation of the descriptive statistics is sequenced according to the parcels of the theoretical model (refer to figure 4-1). The second section of the chapter provides the results of the reliability calculations of the theoretical model as well as a factor analysis to derive an empirical model. The chapter concludes with the results of the inferential statistics, which consisted of various one-way single factor analyses, three CHAID analyses as well as a log linear regression analysis.

Section 1

4.1 DESCRIPTIVE STATISTICS

Descriptive statistics are presented to provide the response frequencies for each item. In this way they serve as background for the interpretation of the second and third sections of this chapter. Descriptive statistics are reported according to the layout of figure 4-1 and are provided for each of the three campuses separately. Where categories are not similar across campuses, the statistics were recoded and standardized before calculations were done.

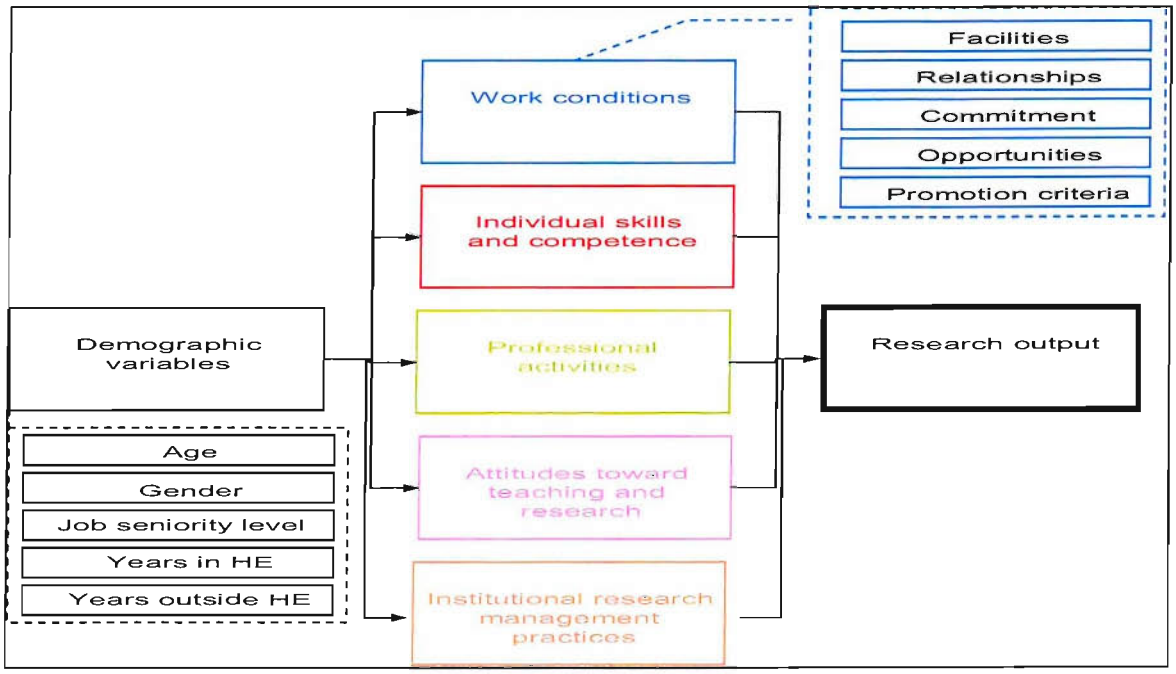


Figure 4-1: Quantitative theoretical model

The descriptive statistics have been augmented by an interpretation of the frequencies as well as results of significant Chi-square tests, conducted for each campus separately. The Chi-square tests compare the demographic variables and each item of the theoretical parcels. Although Chi-square tests form part of inferential statistics, these statistics are reported here since the tests interrogate the data per campus. The third section of this chapter contains inferential statistics that reflect combined

campus statistics in order to form a model that can predict the dependent variable 'Research output'.

4.1.1 PARCEL: DEMOGRAPHIC VARIABLES

Age

Table 4-1: Age – campuses A and C

	Age category		Age category	
	Campus A		Campus C	
	Count	%	Count	%
29 years or younger	36	17.8%	10	15.6%
30–39 years	41	20.3%	22	34.4%
40–49 years	65	32.2%	24	37.5%
50 years or older	60	29.7%	8	12.5%
Total	202	100.0%	64	100.0%

Table 4-2: Age – campus B

Campus B	Age category	
	Count	%
39 years or less	37	39.4%
40 years or older	57	60.6%
Total	94	100.0%

61.9% of respondents on campus A and 60.6% of campus C are 40+ years old. Campus B's respondents are equally divided between <40 years and 40+ years.

Gender

Table 4-3: Gender – campuses A, B and C

	What is your gender?					
	Campus A		Campus B		Campus C	
	Count	%	Count	%	Count	%
Female	79	39.3%	50	53.2%	20	31.3%
Male	122	60.7%	44	46.8%	44	68.8%
Total	201	100.0%	94	100.0%	64	100.0%

Campus A: Response rate is consistent with the actual staff composition of 59% male and 41% female academics.

Campus B: Sufficiently consistent with the actual staff composition of 58% male academics and 42% female academics.

Campus C: The actual staff composition statistics are not available because of the merger and incompatible data sets. The ratio responses obtained are the converse of both campuses A and B, where in each instance more male than female respondents completed the questionnaire.

Job seniority level

Table 4-4: Gender – campuses A, B and C

What is your current job seniority level?						
	Campus A		Campus B		Campus C	
	Count	%	Count	%	Count	%
Junior lecturer	64	31.5%	2	2.1%	13	21.3%
Lecturer	0	0%	38	40.4%	32	52.5%
Senior lecturer	44	21.7%	25	26.6%	12	19.7%
Professor / Departmental chairperson	95	46.8%	29	30.9%	4	6.6%
Total	203	100.0%	94	100.0%	61	100.0%

Campus A: There was poor representation of respondents in the Junior personnel category. The Senior as well as Professor/Departmental Chairperson categories were adequately represented.

Campus B: There was poor representation of respondents in the Junior Lecturer and Lecturer categories. The Professor / Departmental chairperson category was over-represented.

Campus C: Statistics for this campus were not available. The majority of respondents fell within the Lecturer to Senior Lecturer categories, which is in line with the other two campuses' actual job seniority categories.

Years employed in higher education

Table 4-5: Year employed in HE – campus A

Campus A	How many years, in total, have you been employed IN higher education?	
	Count	%
0-5 years	50	24.6%
6-10 years	37	18.2%
11-15 years	36	17.7%
16-20 years	28	13.8%
21-25 years	24	11.8%
26 years or more	28	13.8%
Total	203	100.0%

Campus A: 57% of respondents indicated that they have been employed for between 11 and 26 years or more in higher education, indicating that the academics at campus A have an extensive record of higher education work experience.

Table 4-6: Year employed in HE – campuses B and C

	How many years, in total, have you been employed IN higher education?		How many years, in total, have you been employed IN higher education?	
	Campus B		Campus C	
	Count	%	Count	%
0-10 years	52	55.9%	36	62.1%
11-20 years	27	29.0%	16	27.6%
21 years or more	14	15.1%	6	10.3%
Total	93	100.0%	58	100.0%

Campus B: 56% of respondents indicated that they have been employed for between 0-10 years in higher education, indicating that the respondents have not been with campus A (or in higher education) for long. This finding could be due to a technikon's perceived close link with the business world. Of the remaining respondents, 15% could be deemed to be career academics.

Campus C: The majority of respondents have 10 years or less experience in higher education. There is an indication that only 10% of respondents are career academics and have 21 or more years of experience in higher education.

Years employed outside of higher education

Table 4-7: Years employed outside HE – campus A

Campus A	How many years, in total, have you been involved in professional work OUTSIDE of higher education	
	Count	%
0-5 years	83	48.3%
6-10 years	38	22.1%
11-15 years	25	14.5%
16-20 years	13	7.6%
21-25 years	5	2.9%
26 years or more	8	4.7%
Total	172	100.0%

Campus A: In contrast to the 'Years employed IN higher education' statistics, the years of experience outside of higher education for campus A show that, for the most part, academic staff at campus A are career academics.

Table 4-8: Year employed outside HE – campus B

Campus B	How many years, in total, have you been involved in professional work OUTSIDE of higher education	
	Count	%
0-5 years	34	40.0%
6 years or more	51	60.0%
Total	85	100.0%

Campus B: The majority of respondents (60%) have 6 or more years of experience outside of higher education. More respondents on this campus indicated that they have experience outside of higher education rather than inside higher education.

Table 4-9: Year employed outside HE – campus C

Campus C	How many years, in total, have you been involved in professional work OUTSIDE of higher education	
	Count	%
0-10 years	34	75.6%
11 years or more	11	24.4%
Total	45	100.0%

Campus C: Respondents do not have many years of experience in higher education and they also do not have many years of experience outside of higher education. This indicates that the respondents on this campus do not have many years of work experience, whether inside or outside of higher education.

4.1.2 PARCEL: WORK CONDITIONS - FACILITIES

Table 4-10: Facilities – campus A

Campus A	Poor		2		3		4		Excellent		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Laboratories	4	2.0%	8	4.0%	22	11.1%	16	8.1%	8	4.0%	198	100.0%
Research equipment and instruments	2	1.0%	13	6.7%	29	14.9%	28	14.4%	7	3.6%	194	100.0%
Computers	4	2.0%	15	7.4%	42	20.7%	75	36.9%	60	29.6%	203	100.0%
IT network access and availability	25	12.4%	41	20.4%	62	30.8%	45	22.4%	23	11.4%	201	100.0%
Library holdings – e.g. books, paper-based journals	12	5.9%	27	13.4%	63	31.2%	65	32.2%	30	14.9%	202	100.0%
Electronic journals	6	3.1%	36	18.4%	51	26.0%	54	27.6%	25	12.8%	196	100.0%
Office space	8	4.0%	21	10.4%	45	22.4%	73	36.3%	50	24.9%	201	100.0%
Secretarial support	39	19.5%	44	22.0%	40	20.0%	39	19.5%	27	13.5%	200	100.0%
Research support staff	67	33.5%	38	19.0%	27	13.5%	12	6.0%	7	3.5%	200	100.0%

Table 4-11: Facilities – campus B

Campus B	Poor		2		3		4		Excellent		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Laboratories	11	22.4%	9	18.4%	13	26.5%	13	26.5%	3	6.1%	49	100.0%
Research equipment and instruments	13	27.7%	11	23.4%	14	29.8%	5	10.6%	4	8.5%	47	100.0%
Computers	8	10.0%	10	12.5%	20	25.0%	28	35.0%	14	17.5%	80	100.0%
IT network access and availability	10	13.0%	10	13.0%	22	28.6%	31	40.3%	4	5.2%	77	100.0%
Library holdings – e.g. books, paper-based journals	11	12.8%	22	25.6%	26	30.2%	20	23.3%	7	8.1%	86	100.0%
Electronic journals	13	18.6%	17	24.3%	26	37.1%	9	12.9%	5	7.1%	70	100.0%
Office space	15	17.9%	10	11.9%	15	17.9%	31	36.9%	13	15.5%	84	100.0%
Secretarial support	26	32.1%	18	22.2%	14	17.3%	14	17.3%	9	11.1%	81	100.0%
Research support staff	24	36.9%	13	20.0%	18	27.7%	8	12.3%	2	3.1%	65	100.0%

Table 4-12: Facilities – campus C

Campus C	Poor		2		3		4		Excellent	
	Count	%	Count	%	Count	%	Count	%	Count	%
Laboratories	10	41.7%	6	25.0%	5	20.8%	3	12.5%		
Research equipment and instruments	12	40.0%	5	16.7%	9	30.0%	3	10.0%	1	3.3%
Computers	26	43.3%	14	23.3%	10	16.7%	6	10.0%	4	6.7%
IT network access and availability	25	44.6%	13	23.2%	10	17.9%	7	12.5%	1	1.8%
Library holdings – e.g. books, paper-based journals	14	25.5%	14	25.5%	15	27.3%	6	10.9%	6	10.9%
Electronic journals	25	47.2%	8	15.1%	9	17.0%	8	15.1%	3	5.7%
Office space	5	9.1%	6	10.9%	14	25.5%	13	23.6%	17	30.9%
Secretarial support	37	74.0%	3	6.0%	6	12.0%	2	4.0%	2	4.0%
Research support staff	34	68.0%	9	18.0%	3	6.0%	2	4.0%	2	4.0%

Valid responses to this theoretical parcel and its items were very low. This could be an indication that respondents do not make use of the facilities or that they do not have an opinion regarding the quality of those facilities.

4.1.3 PARCEL: WORK CONDITIONS – RELATIONSHIPS

Table 4-13: Relationships – campus A

Campus A	Poor		2		3		4		Excellent		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
The intellectual atmosphere e.g. academic standards and status of the institution	2	1.0%	23	11.5%	67	33.5%	79	39.5%	29	14.5%	200	100.0%
Relationships between the academics and departmental management	9	4.5%	22	11.0%	46	23.0%	90	45.0%	33	16.5%	200	100.0%
Relationships between academics and faculty management	16	8.0%	24	11.9%	82	40.8%	59	29.4%	20	10.0%	201	100.0%
Relationships between academics and university management	16	8.0%	35	17.4%	77	38.3%	56	27.9%	17	8.5%	201	100.0%
Academic morale e.g. positive attitude	16	8.0%	34	16.9%	88	43.8%	52	25.9%	11	5.5%	201	100.0%
Clarity on the new institutional vision	44	21.9%	70	34.8%	57	28.4%	26	12.9%	4	2.0%	201	100.0%
Your sense of belonging at Campus A	12	5.9%	30	14.9%	62	30.7%	66	32.7%	32	15.8%	202	100.0%

Campus A: *Cross-tabulation of relationships between academics and faculty management and age category*

The age group 40–49 years indicated medium to high levels in the quality of relationships between academics and faculty management, with the age group 50 years and older indicating the highest level of satisfaction with the relationships between academics and faculty management, at 42%. The age group 30–39 years indicated a low to medium level of satisfaction with the relationships between themselves and faculty management (χ^2=13.354; df=6; p=0.038).

Campus A: *Cross-tabulation of academic morale and gender*

Female respondents were less positive about the academic morale i.e. a positive attitude, with more respondents indicating medium levels of morale (44 respondents) than high levels of morale (18 respondents), whereas their male counterparts had 44 respondents indicating medium levels and 44 indicating high levels of academic morale (χ^2=8.285; df=2; p=0.016).

Table 4-14: Relationships – campus B

Campus B	Poor		2		3		4		Excellent		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
The intellectual atmosphere e.g. academic standards and status of the institution	9	9.7%	24	25.8%	40	43.0%	20	21.5%			93	100.0%
Relationships between the academics and departmental management	7	7.5%	15	16.1%	36	38.7%	27	29.0%	8	8.6%	93	100.0%
Relationships between academics and faculty management	7	7.7%	28	30.8%	28	30.8%	25	27.5%	3	3.3%	91	100.0%
Relationships between academics and university management	28	30.4%	32	34.8%	28	30.4%	4	4.3%			92	100.0%
Morale amongst academics e.g. positive attitude	20	21.5%	42	45.2%	26	28.0%	4	4.3%	1	1.1%	93	100.0%
Faith in the future of the new university	4	4.3%	6	6.5%	40	43.5%	35	38.0%	7	7.6%	92	100.0%
Your sense of belonging at campus B	12	13.2%	14	15.4%	31	34.1%	30	33.0%	4	4.4%	91	100.0%

Campus B: *Cross-tabulation of relationships with faculty management and number of years work outside higher education*

Academics who have 0–10 years of limited work experience outside of higher education indicated a poor relationship with faculty management (χ^2=10.708; df=2; p=0.005). On the other hand, academics that have 11 years or more work experience outside of higher education indicated high levels of satisfaction in their relationship with faculty management. Cramer's V value (0.318; p=0.005) indicates that this is a medium relation.

Table 4-15: Relationships – campus C

Campus C	Low		Average		High		Total	
	Count	%	Count	%	Count	%	Count	%
The intellectual atmosphere e.g. academic standards and status of the institution	16	27.6%	14	24.1%	28	48.3%	58	100.0%
Relationships between the academics and departmental management	11	18.3%	20	33.3%	29	48.3%	60	100.0%
Relationships between academics and faculty management	13	22.0%	19	32.2%	27	45.8%	59	100.0%
Relationships between academics and university management	19	33.3%	19	33.3%	19	33.3%	57	100.0%
Academic morale e.g. positive attitude	23	38.3%	15	25.0%	22	36.7%	60	100.0%
Clarity on the new institutional vision	12	20.0%	15	25.0%	33	55.0%	60	100.0%
Your sense of belonging at campus C	17	27.9%	18	29.5%	26	42.6%	61	100.0%

Campus C had a high rating for relationships overall.

4.1.4 PARCEL: WORK CONDITIONS - COMMITMENT

Table 4-16: Commitment – campus A

Campus A	Strong negative influence		2		3		4		Strong positive influence		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Physical resources and infrastructure	6	3.0%	23	11.4%	65	32.2%	69	34.2%	39	19.3%	202	100.0%
Flexible workplace arrangements e.g. can work from home	9	4.4%	13	6.4%	29	14.2%	57	27.9%	96	47.1%	204	100.0%
A safe and secure working environment	2	1.0%	4	2.0%	40	19.7%	80	39.4%	77	37.9%	203	100.0%
Family commitments	12	6.0%	18	9.0%	69	34.5%	63	31.5%	38	19.0%	200	100.0%
Opportunity to earn extra income	18	9.0%	36	18.1%	67	33.7%	51	25.6%	27	13.6%	199	100.0%
Social relationships at work	8	4.0%	28	13.9%	72	35.6%	60	29.7%	34	16.8%	202	100.0%
Opportunity to network nationally and internationally	5	2.5%	10	5.0%	48	23.8%	75	37.1%	64	31.7%	202	100.0%
Academic reputation of institution	1	.5%	10	4.9%	61	29.9%	71	34.8%	61	29.9%	204	100.0%
Opportunity to realize personal goals	11	5.4%	16	7.9%	37	18.2%	84	41.4%	55	27.1%	203	100.0%

Campus A: The following items received a high rating, which indicates possible reasons for commitment to the campus:

- Flexible workplace arrangements (75%);
- Opportunity to network nationally and internationally (68.8%);
- Academic reputation of the institution (64.7%); and
- Opportunity to realize personal goals (68.5%).

The above items are all intangible factors which have a high rating for commitment to campus A.

Table 4-17: Commitment – campus B

Campus B	Strong negative influence		2		3		4		Strong positive influence		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
State of physical resources and infrastructure	27	30.0%	29	32.2%	22	24.4%	7	7.8%	5	5.6%	90	100.0%
Flexible workplace arrangements e.g. can work from home	15	18.1%	21	25.3%	12	14.5%	19	22.9%	16	19.3%	83	100.0%
A safe and secure working environment	30	32.6%	25	27.2%	18	19.6%	10	10.9%	9	9.8%	92	100.0%
Accommodation of family commitments	8	9.4%	10	11.8%	33	38.8%	21	24.7%	13	15.3%	85	100.0%
Opportunity to earn extra income	17	21.5%	24	30.4%	15	19.0%	11	13.9%	12	15.2%	79	100.0%
Social relationships at work	7	8.0%	13	14.9%	26	29.9%	23	26.4%	18	20.7%	87	100.0%
Opportunity to network nationally and internationally	8	9.4%	14	16.5%	30	35.3%	21	24.7%	12	14.1%	85	100.0%
Academic reputation of institution	6	6.7%	17	18.9%	33	36.7%	21	23.3%	13	14.4%	90	100.0%
Opportunity to realize personal goals	10	11.2%	17	19.1%	21	23.6%	20	22.5%	21	23.6%	89	100.0%

Campus B: None of the intangible factors that could indicate commitment to campus B received a rating above 50%. This indicates either that none of the above intangibles are available to respondents or that respondents do not feel that these intangible factors increase their commitment to campus B.

Table 4-18: Commitment – campus C

Campus C	Strong negative influence		3		Strong positive influence		Total	
	Count	%	Count	%	Count	%	Count	%
State of physical resources and infrastructure	20	33.3%	16	26.7%	24	40.0%	60	100.0%
Flexible workplace arrangements e.g. can work from home	12	21.1%	14	24.6%	31	54.4%	57	100.0%
A safe and secure working environment	10	16.4%	14	23.0%	37	60.7%	61	100.0%
Accommodation of family commitments	11	21.2%	17	32.7%	24	46.2%	52	100.0%
Opportunity to earn extra income	13	25.0%	19	36.5%	20	38.5%	52	100.0%
Social relationships at work	10	17.2%	20	34.5%	28	48.3%	58	100.0%
Opportunity to network nationally and internationally	12	20.3%	15	25.4%	32	54.2%	59	100.0%
Academic reputation of institution	5	8.3%	11	18.3%	44	73.3%	60	100.0%
Opportunity to realize personal goals	2	3.6%	11	20.0%	42	76.4%	55	100.0%

Campus C: At campus C the following items received a high rating, which indicates possible reasons for commitment to the campus:

- A safe and secure working environment (60.7%);
- Academic reputation of the institution (73.3%); and
- Opportunity to realize personal goals (76.4%).

Campus C: *Cross-tabulation of opportunity to earn extra income and gender*

Female respondents were more positive, and indicated an average commitment to the institution regarding the opportunity to earn extra income, and male respondents were negative about their commitment to campus C due to a lack of opportunity to earn extra income (χ^2=9.438; df=2; p=0.009). A Cramer's V value indicated a medium relation (0.426; p=0.009).

4.1.5 PARCEL: WORK CONDITIONS – OPPORTUNITIES

Inter-disciplinary and inter-institutional research opportunities

Table 4-19: Inter-disciplinary and inter-institutional research opportunities – campus A

Campus A	To what extent is there opportunity to get involved in research across academic disciplines at campus A? (inter-disciplinary)		To what extent is there opportunity to get involved in research across institutions? (inter-institutional)	
	Count	%	Count	%
No opportunity	12	6.0%	18	9.0%
2	74	37.0%	67	33.3%
3	47	23.5%	51	25.4%
4	51	25.5%	42	20.9%
Many opportunities	16	8.0%	23	11.4%
Total	200	100.0%	201	100.0%

Campus A indicates that there are more opportunities to get involved inter-institutionally than within the institution through inter-disciplinary research.

Table 4-20: Inter-disciplinary and inter-institutional research opportunities – campus B

Campus B	To what extent is there opportunity to get involved in research across academic disciplines at campus B? (inter-disciplinary)		To what extent is there opportunity to get involved in research across institutions? (inter-institutional)	
	Count	%	Count	%
No opportunity	13	14.6%	12	13.3%
2	29	32.6%	29	32.2%
3	30	33.7%	28	31.1%
4	10	11.2%	15	16.7%
Many opportunities	7	7.9%	6	6.7%
Total	89	100.0%	90	100.0%

Campus B indicates that there are fewer opportunities to get involved inter-institutionally than within the institution through inter-disciplinary research; however, there are very few opportunities to get involved in either inter-disciplinary or inter-institutional research overall.

Table 4-21: Inter-disciplinary and inter-institutional research opportunities – campus C

Campus C	To what extent is there opportunity to get involved in research across academic disciplines at Campus C? (inter-disciplinary)		To what extent is there opportunity to get involved in research across institutions? (inter-institutional)	
	Count	%	Count	%
No opportunity	15	25.4%	20	33.9%
3	20	33.9%	16	27.1%
Many opportunities	24	40.7%	23	39.0%
Total	59	100.0%	59	100.0%

Campus C indicates the opposite to the other two campuses in that there are approximately the same opportunities to get involved in inter-disciplinary and inter-institutional research.

Opportunities to improve skills

Table 4-22: Opportunities to improve skills – campus A

Campus A	How many research opportunities are there at campus A where you can improve/hone your research skills?	
	Count	%
Very few	25	12.3%
2	44	21.6%
3	62	30.4%
4	55	27.0%
Plentiful	18	8.8%
Total	204	100.0%

Campus A: *Cross-tabulation of research opportunities and age category*

The age group 40–49 years indicated most strongly that there were plentiful to many opportunities to hone research skills at campus A (74%). 83% of the age group 30–39 years felt that there were very few opportunities to hone their research skills (χ^2=23.619; df=12; p=0.023).

Table 4-23: Opportunities to improve skills – campus B

Campus B	How many opportunities are there at campus B where you can improve/hone your research skills?	
	Count	%
Very few	18	19.8%
2	25	27.5%
3	27	29.7%
4	19	20.9%
Plentiful	2	2.2%
Total	91	100.0%

Campus B: *Cross-tabulation of opportunities to hone research skills and gender*

A Chi-square test (χ^2=6.044; df=2; p=0.049) indicated that female respondents rated the opportunities to hone their research skills at campus B as average to plentiful. Their male counterparts rated the opportunities as few. Cramer's V value (0.244; p=0.049) indicates a small relation.

Table 4-24: Opportunities to improve skills – campus C

Campus C	How many opportunities are there at campus C where you can improve/hone your research skills?	
	Count	%
Few	12	20.0%
3	19	31.7%
Plentiful	29	48.3%
Total	60	100.0%

Campus C indicated that there were medium to plentiful opportunities to hone research skills.

4.1.6 PARCEL: WORK CONDITIONS - PROMOTION CRITERIA

Table 4-25: Promotion criteria – campus A

Campus A	Strongly disagree		2		3		4		Strongly agree		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
A strong record of successful research activity is important in an academic's evaluation	5	2.5%	16	7.8%	37	18.1%	64	31.4%	82	40.2%	204	100.0%
In my department/division it is difficult for a person to achieve promotion if he/she does not publish	12	5.9%	7	3.5%	37	18.3%	46	22.8%	100	49.5%	202	100.0%
An academic's promotion is based on quantity, not quality, of research output	31	15.3%	28	13.9%	41	20.3%	50	24.8%	52	25.7%	202	100.0%
An academic's international network is important in his/her evaluation at this institution	12	6.1%	27	13.6%	55	27.8%	64	32.3%	40	20.2%	198	100.0%

Campus A's respondents indicated that an academic's promotion is based on quantity and not quality of research output (50.5%). Furthermore, respondents felt that it was difficult to achieve promotion if they did not publish (72.3%).

Campus A: *Cross-tabulation of international network and age category*

The age groups of 40–49 years, as well as 50 years and older, were most in agreement with the statement that an academic's international network was important in his/her evaluation at campus A, with 33% and 39% of respondents, respectively, selecting this response (χ^2=17.081; df=6; p=0.009).

Table 4-26: Promotion criteria – campus B

Campus B	Strongly disagree		2		3		4		Strongly agree		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
A strong record of successful research activity is important in an academic's evaluation	10	11.2%	19	21.3%	26	29.2%	15	16.9%	19	21.3%	89	100.0%
In my department it is difficult for a person to achieve promotion if he/she does not publish	18	20.2%	17	19.1%	23	25.8%	12	13.5%	19	21.3%	89	100.0%
An academic's promotion is based on quantity, not quality, of research output	19	21.3%	20	22.5%	25	28.1%	13	14.6%	12	13.5%	89	100.0%
An academic's international network is important in his/her evaluation at this institution	13	15.5%	17	20.2%	29	34.5%	15	17.9%	10	11.9%	84	100.0%

Campus B's respondents indicated that an academic's promotion is not based on quantity but on quality of research output (43.8%). Respondents did not strongly agree with the rest of the items.

Table 4-27: Promotion criteria – campus C

Campus C	Strongly disagree		3		Strongly agree		Total	
	Count	%	Count	%	Count	%	Count	%
A strong record of successful research activity is important in an academic's evaluation	5	8.2%	14	23.0%	42	68.9%	61	100.0%
In my department it is difficult for a person to achieve promotion if he/she does not publish	7	12.5%	11	19.6%	38	67.9%	56	100.0%
An academic's promotion is based on quantity, not quality, of research output	17	29.8%	15	26.3%	25	43.9%	57	100.0%
An academic's international network is important in his/her evaluation at this institution	8	15.7%	18	35.3%	25	49.0%	51	100.0%

Campus C's respondents indicated that an academic's promotion is based on quantity and not on quality of research output (43.9%). Furthermore, respondents felt that a strong record of research activity was important in an academic's evaluation (68.9%).

4.1.7 PARCEL: INDIVIDUAL SKILLS AND COMPETENCE

Independent research

Table 4-28: Independent research – campus A

Campus A	How capable do you rate yourself to conduct independent research?	
	Count	%
Not capable	1	.5%
2	7	3.4%
3	44	21.6%
4	80	39.2%
Very capable	72	35.3%
Total	204	100.0%

Campus A's respondents felt that they were very capable to conduct independent research (74.5%). This campus had high actual research output.

Table 4-29: Independent research – campus B

Campus B	How capable do you rate yourself to conduct independent research?	
	Count	%
Not capable	2	2.2%
2	15	16.5%
3	27	29.7%
4	27	29.7%
Very capable	20	22.0%
Total	91	100.0

Campus B's respondents indicated a medium to capable rating to conduct independent research. This campus had very low actual research output.

Campus B: *Cross-tabulation of confidence about independent research and gender*

Confidence regarding their ability to conduct independent research is dependent on gender at campus B. A Chi-square test (χ^2=8.277; df=2; p=0,016; Cramer's V=0,302) revealed that female respondents (67%) had higher levels of overall confidence than their male counterparts. There is a medium relation between confidence and gender according to the Cramer's V score.

Table 4-30: Independent research – campus C

Campus C	How capable do you rate yourself to conduct independent research?	
	Count	%
Not capable	6	10.0%
3	13	21.7%
Very capable	41	68.3%
Total	60	100.0%

Campus C's respondents indicated that they were very capable of conducting independent research (68.3%). This campus had a very low actual research output.

Study guidance

Table 4-31: Study guidance – campus A

Campus A	How confident are you about your ability to provide study guidance to postgraduate students?	
	Count	%
Not confident	4	2.0%
2	11	5.4%
3	31	15.3%
4	82	40.6%
Very confident	74	36.6%
Total	202	100.0%

Campus A's respondents indicated high levels of confidence to provide study guidance to postgraduate students (77.2%).

Table 4-32: Study guidance – campus B

Campus B	How confident are you about your ability to provide study guidance to postgraduate students?	
	Count	%
Not confident	15	16.3%
2	16	17.4%
3	23	25.0%
4	24	26.1%
very confident	14	15.2%
Total	92	100.0%

Campus B's respondents reported medium to high levels of confidence to provide study guidance to postgraduate students.

Campus B: *Cross-tabulation of confidence about study guidance and gender*

Confidence regarding the ability to conduct study guidance is dependent on gender at campus B. A Chi-square test (χ^2=11.602; df=2; p=0,003; Cramer's V=0.355) revealed that female respondents (58%) had higher levels of confidence than their male counterparts. A Cramer's V value revealed that there is a medium relation between confidence and gender.

Table 4-33: Study guidance – campus C

Campus C	How confident are you about your ability to provide study guidance to postgraduate students?	
	Count	%
Not confident	10	16.7%
3	14	23.3%
very confident	36	60.0%
Total	60	100.0%

Campus C's respondents indicated high levels of confidence to provide study guidance to postgraduate students (60%).

4.1.8 PARCEL: PROFESSIONAL ACTIVITIES

Table 4-34: Membership of societies – campus A

Campus A	Belong to national societies		Belong to international societies	
	Count	%	Count	%
0 societies	20	10.4%	71	41.5%
1 societies	76	39.6%	56	32.7%
2 societies	57	29.7%	30	17.5%
3 societies or more	39	20.3%	14	8.2%
Total	192	100.0%	171	100.0%

Campus A had high levels of membership of national societies and fewer international memberships.

Campus A: *Cross-tabulation of national societies and age category*

On campus A, the more senior the respondent in age, the more national societies he/she belongs to (χ^2=20.305; df=9; p=0,016).

Table 4-35: Attendance of conferences – campus A

Campus A	Attended national conferences		Attended international conferences	
	Count	%	Count	%
0-2 conferences	76	38.8%	129	70.1%
3-5 conferences	85	43.4%	46	25.0%
6 or more conferences	35	17.9%	9	4.9%
Total	196	100.0%	184	100.0%

Campus A had high levels of national conference attendance and less international conference attendance.

Table 4-36: Membership of societies – campus B

Campus B	Belong to national societies		Belong to international societies	
	Count	%	Count	%
0 societies	15	19.5%	46	75.4%
1 societies	32	41.6%	12	19.7%
Two or more	30	39.0%	3	4.9%
Total	77	100.0%	61	100.0%

Campus B shows few overall national as well as international memberships.

Table 4-37: Attendance of conferences – campus B

Campus B	Attended national conferences		Attended international conferences	
	Count	%	Count	%
None	10	12.3%	40	63.5%
One conference	19	23.5%	15	23.8%
Two or more	52	64.2%	8	12.7%
Total	81	100.0%	63	100.0%

Campus B shows poorer international than national conference attendance.

Table 4-38: Membership of societies – campus C

Campus C	Belong to national societies		Belong to international societies	
	Count	%	Count	%
0 societies	11	20.8%	39	84.8%
1 societies	24	45.3%	5	10.9%
Two or more	18	34.0%	2	4.3%
Total	53	100.0%	46	100.0%

Campus C has few national and international memberships.

Table 4-39: Attendance of conferences – campus C

Campus C	Attended national conferences		Attended international conferences	
	Count	%	Count	%
None	16	26.7%	35	76.1%
One conference	16	26.7%	4	8.7%
Two or more	28	46.7%	7	15.2%
Total	60	100.0%	46	100.0%

Campus C shows poor national and international conference attendance. International conference attendance is lower than national attendance.

4.1.8.1 Recoding of professional activities

Professional activities were recoded to ensure standardization across campuses. Furthermore, membership of societies and attendance of conferences were combined to provide an aggregated figure in order to render data useful for the CHAID and regression analyses.

Table 4-40: Recoding of professional activities

Statistics – Professional activities		
N	Valid	259
	Missing	103
Mean		6.5792
Std. Deviation		4.85332
Skewness		1.129
Kurtosis		2.315

Professional activities : Total number of society memberships & conferences attended

Campuses A, B and C		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	14	3.9	5.4	5.4
	1.00	22	6.1	8.5	13.9
	2.00	16	4.4	6.2	20.1
	3.00	25	6.9	9.7	29.7
	4.00	31	8.6	12.0	41.7
	5.00	15	4.1	5.8	47.5
	6.00	23	6.4	8.9	56.4
	7.00	23	6.4	8.9	65.3
	8.00	14	3.9	5.4	70.7
	9.00	9	2.5	3.5	74.1

	10.00	17	4.7	6.6	80.7
	11.00	10	2.8	3.9	84.6
	12.00	6	1.7	2.3	86.9
	13.00	10	2.8	3.9	90.7
	14.00	5	1.4	1.9	92.7
	15.00	6	1.7	2.3	95.0
	16.00	5	1.4	1.9	96.9
	17.00	2	.6	.8	97.7
	18.00	2	.6	.8	98.5
	19.00	1	.3	.4	98.8
	20.00	1	.3	.4	99.2
	21.00	1	.3	.4	99.6
	32.00	1	.3	.4	100.0
	Total	259	71.5	100.0	
Missing	System	103	28.5		
Total		362	100.0		

4.1.9 PARCEL: ATTITUDES TOWARD TEACHING AND RESEARCH

Table 4-41: Integration of findings – campuses A and B

	To what extent do you integrate your research findings with your teaching activities?			
	Campus A		Campus B	
	Count	%	Count	%
Very little integration	11	5.4%	11	16.4%
2	19	9.4%	14	20.9%
3	40	19.7%	17	25.4%
4	49	24.1%	7	10.4%
Integrated to a great extent	72	35.5%	18	26.9%
Not applicable	12	5.9%	0	0%
Total	203	100.0%	67	100.0%

Campus A integrates research findings with teaching activities.

Campus B is polarized in integrating research findings with teaching activities.

Table 4-42: Integration of findings – campus C

Campus C	To what extent do you integrate your research findings with your teaching activities?	
	Count	%
Very little integration	13	25.5%
3	10	19.6%
Integrated to a great extent	28	54.9%
Total	51	100.0%

Staff members on campus C indicated that they do integrate research findings with teaching activities.

Table 4-43: Components of academic career – campus A

Campus A	To what extent do you believe that an academic career can be research free?		To what extent do you believe that an academic career can be community service free?		To what extent do you believe that an academic career can be teaching free?	
	Count	%	Count	%	Count	%
No extent	149	73.0%	53	26.0%	108	52.9%
2	28	13.7%	53	26.0%	33	16.2%
3	10	4.9%	45	22.1%	33	16.2%
4	13	6.4%	30	14.7%	18	8.8%
Great extent	4	2.0%	23	11.3%	12	5.9%
Total	204	100.0%	204	100.0%	204	100.0%

Campus A indicated that an academic career had to consist of teaching, research and community service.

Campus A: *Cross-tabulation of components of academic career and age category*

The age category of 40–49 years were the strongest supporters of the opinion that a career could be community service free, with 52% of respondents indicating that a career can be community service free to a great extent (χ^2=18.848; df=6; p=0,004).

Campus A: *Cross-tabulation of components of academic career and gender*

Males felt more strongly that an academic's career can be community service free, with 79% of respondents in the category of 'community service free' being male (χ^2=9.752; df=2; p=0,008).

Table 4-44: Components of academic career – campus B

Campus B	To what extent do you believe that an academic career can be research free?		To what extent do you believe that an academic career can be community service free?		To what extent do you believe that an academic career can be teaching free?	
	Count	%	Count	%	Count	%
No extent	47	50.5%	25	26.6%	46	48.9%
2	17	18.3%	25	26.6%	24	25.5%
3	17	18.3%	21	22.3%	16	17.0%
4	9	9.7%	17	18.1%	6	6.4%
Great extent	3	3.2%	6	6.4%	2	2.1%
Total	93	100.0%	94	100.0%	94	100.0%

Campus B indicated that an academic career had to consist of teaching, research and community service.

Table 4-45: Components of academic career – campus C

Campus C	To what extent do you believe that an academic career can be research free?		To what extent do you believe that an academic career can be community service free?		To what extent do you believe that an academic career can be teaching free?	
	Count	%	Count	%	Count	%
No extent	47	75.8%	45	71.4%	49	79.0%
3	10	16.1%	11	17.5%	7	11.3%
Great extent	5	8.1%	7	11.1%	6	9.7%
Total	62	100.0%	63	100.0%	62	100.0%

Campus C indicated that an academic career had to consist of teaching, research and community service.

Table 4-46: Agreement with statements – campus A

Campus A	To what extent do you agree with the following statement: A good research supervisor is a good researcher		To what extent do you agree with the following statement: A good researcher is a good research supervisor	
	Count	%	Count	%
Strongly disagree	11	5.4%	21	10.3%
2	26	12.8%	56	27.5%
3	42	20.7%	52	25.5%
4	68	33.5%	46	22.5%
Strongly agree	56	27.6%	29	14.2%
Total	203	100.0%	204	100.0%

Campus A's respondents were clear in their opinion that a good supervisor was a good researcher (61.1%). On the other hand, they indicated that a good researcher was not necessarily a good supervisor (37.8%). It can be deduced that in the opinion of this campus not all researchers can supervise students well.

Table 4-47: Agreement with statements – campus B

Campus B	To what extent do you agree with the following statement: A good research supervisor is a good researcher		To what extent do you agree with the following statement: A good researcher is a good research supervisor	
	Count	%	Count	%
Strongly disagree	6	6.4%	10	10.6%
2	17	18.1%	37	39.4%
3	39	41.5%	30	31.9%
4	19	20.2%	7	7.4%
Strongly agree	13	13.8%	10	10.6%
Total	94	100.0%	94	100.0%

Campus B's respondents did not make a clear distinction between the two statements, and remained neutral.

Table 4-48: Agreement with statements – campus C

Campus C	To what extent do you agree with the following statement: A good research supervisor is a good researcher		To what extent do you agree with the following statement: A good researcher is a good research supervisor	
	Count	%	Count	%
Strongly disagree	3	4.8%	11	17.7%
3	11	17.7%	15	24.2%
Strongly agree	48	77.4%	36	58.1%
Total	62	100.0%	62	100.0%

Campus C's respondents indicated that, in their opinion, a good supervisor was a good researcher (77.4%). They also indicated that a good researcher is a good supervisor (58.1%). This campus is of the opinion that if you can research well then you can necessarily supervise students well and vice versa.

Table 4-49: View of research and teaching outputs – campuses A and B

	To what extent, in your view, is research supervision of master's and doctoral students a research output or a teaching output?			
	Campus A		Campus B	
	Count	%	Count	%
Research output	26	12.7%	10	10.8%
2	47	23.0%	15	16.1%
3	66	32.4%	37	39.8%
4	50	24.5%	21	22.6%
Teaching output	15	7.4%	10	10.8%
Total	204	100.0%	93	100.0%

Table 4-50: View of research and teaching outputs – campus C

Campus C	To what extent, in your view, is research supervision of master's and doctoral students a research output or a teaching output?	
	Count	%
Research output	22	36.1%
3	21	34.4%
Teaching output	18	29.5%
Total	61	100.0%

Overall, on campuses A and C respondents were inclined to view the supervision of postgraduate students as a research output. Campus B was more inclined to view supervision as a teaching output.

Table 4-51: Meaningful research – campuses A and B

	Indicate what, in your view, constitutes meaningful research			
	Campus A		Campus B	
	Count	%	Count	%
Fundamental research	11	5.4%	0	0%
2	16	7.8%	1	1.1%
3	84	41.2%	37	41.1%
4	64	31.4%	30	33.3%
Applied research	29	14.2%	22	24.4%
Total	204	100.0%	90	100.0%

Table 4-52: Meaningful research – campus C

Campus C	Indicate what, in your view, constitutes meaningful research	
	Count	%
Fundamental research	2	3.2%
3	28	45.2%
Applied research	32	51.6%
Total	62	100.0%

Overall, all campuses leaned towards applied research as meaningful.

4.1.10 INSTITUTIONAL RESEARCH MANAGEMENT PRACTICES

Communication

Table 4-53: Research performance – campus A

Campus A	How informed are you about campus A's research performance relative to that of other academic institutions?		How informed are you about your faculty's/divisions research performance relative to that of other faculties/divisions at campus A?	
	Count	%	Count	%
Poorly informed	48	23.5%	44	21.6%
2	47	23.0%	58	28.4%
3	46	22.5%	39	19.1%
4	42	20.6%	46	22.5%
Well informed	21	10.3%	17	8.3%
Total	204	100.0%	204	100.0%

Campus A's respondents indicated that they were medium to poorly informed about institutional as well as faculty research performance.

Campus A: *Cross-tabulation of institutional research performance and gender*

Investigating the gender cross-tabulation and conducting Chi-square test (χ^2=9.783; df=4; p=0.044) gives an indication that female respondents rate their knowledge regarding campus A's research performance, relative to that of other academic institutions, lower than their male counterparts.

Table 4-54: Research performance – campus B

Campus B	How informed are you about campus B's research performance relative to that of other academic institutions?		How informed are you about your faculty's/divisions research performance relative to that of other faculties/divisions at campus B?	
	Count	%	Count	%
Poorly informed	24	25.8%	19	20.4%
2	21	22.6%	28	30.1%
3	23	24.7%	24	25.8%
4	20	21.5%	19	20.4%
Well informed	5	5.4%	3	3.2%
Total	93	100.0%	93	100.0%

Campus B's respondents also indicated that they were medium to poorly informed about institutional as well as faculty research performance.

Table 4-55: Research performance – campus C

Campus C	How informed are you about campus C's research performance relative to that of other academic institutions?		How informed are you about your faculty's/divisions research performance relative to that of other faculties/divisions at campus C?	
	Count	%	Count	%
Poorly informed	39	66.1%	35	59.3%
3	9	15.3%	11	18.6%
Well informed	11	18.6%	13	22.0%
Total	59	100.0%	59	100.0%

Campus C echoed the sentiments of the other two campuses.

The communication of information regarding research performance seems problematic on all three campuses.

Table 4-56: Research policy – campuses A and B

	How much do you know about your faculty's/division's research policy?			
	Campus A		Campus B	
	Count	%	Count	%
Not much	31	15.2%	14	15.1%
2	48	23.5%	17	18.3%
3	50	24.5%	29	31.2%
4	47	23.0%	25	26.9%
Fully informed	28	13.7%	8	8.6%
Total	204	100.0%	93	100.0%

Campus A's opinion regarding how informed they are about research policy was spread evenly between not much and fully informed.

Campus B's respondents remained neutral, indicating that they were neither uninformed nor fully informed about research policy.

Table 4-57: Research policy – campus C

Campus C	How much do you know about your faculty's/division's research policy?	
	Count	%
Not much	33	56.9%
3	17	29.3%
Fully informed	8	13.8%
Total	58	100.0%

Campus C's respondents indicated that they did not know much about their faculty's research policy.

Focus areas

Table 4-58: Focus areas – campus A

Campus A	How important are research focus areas for your department's/division's research functioning?		How important are research focus areas for the university's research functioning?	
	Count	%	Count	%
Not important	24	11.8%	13	6.4%
2	36	17.6%	22	10.8%
3	46	22.5%	68	33.5%
4	62	30.4%	66	32.5%
Very important	36	17.6%	34	16.7%
Total	204	100.0%	203	100.0%

Respondents on campus A indicated that they regarded research focus areas as important at departmental/divisional (micro) level as well as at institutional (macro) level.

Table 4-59: Focus areas – campus B

Campus B	How important are research focus areas for your department's/division's research functioning?		How important are research focus areas for the technikon's research functioning?	
	Count	%	Count	%
Not important	8	8.9%	5	5.7%
2	10	11.1%	8	9.1%
3	34	37.8%	32	36.4%
4	22	24.4%	27	30.7%
Very important	16	17.8%	16	18.2%
Total	90	100.0%	88	100.0%

Respondents on campus B indicated that they regarded research focus areas as important at departmental/divisional (micro) level as well as at institutional (macro) level.

Campus B: *Cross-tabulation of importance of research focus areas and gender*

A Chi-square test (χ^2=6.175; df=2; p=0.046) indicated that female respondents were more appreciative of the importance of research focus areas for the functioning of their faculty than were their male counterparts. A Cramer's V value (0.262; p=0.046)

indicated that this relation is small but not insignificant. Male respondents considered research focus areas for the functioning of their faculty to be of medium importance.

Table 4-60: Focus areas – campus C

Campus C	How important are research focus areas for your department's/division's research functioning?		How important are research focus areas for the university's research functioning?	
	Count	%	Count	%
Not important	11	20.4%	6	10.7%
3	15	27.8%	13	23.2%
Very important	28	51.9%	37	66.1%
Total	54	100.0%	56	100.0%

Campus C's respondents also indicated that they regarded research focus areas as important at departmental/divisional (micro) level as well as at institutional (macro) level.

Performance management

Table 4-61: Formal contracting – campuses A and B

	How specifically have research outputs been contracted with you?			
	Campus A		Campus B	
	Count	%	Count	%
Not specific	96	48.0%	24	28.2%
2	43	21.5%	16	18.8%
3	32	16.0%	27	31.8%
4	17	8.5%	12	14.1%
Very specific	12	6.0%	6	7.1%
Total	200	100.0%	85	100.0%

According to the responses, research outputs were not specifically contracted with respondents from campus A (69.5%), but were more specifically contracted with respondents on campus B.

Table 4-62: Formal contracting – campus C

Campus C	How specifically have research outputs been contracted with you?	
	Count	%
Not specific	34	64.2%
3	15	28.3%
Very specific	4	7.5%
Total	53	100.0%

Respondents of campus A were of the opinion that research outputs were not specifically contracted with them (64.2%).

From the above it can be deduced that campuses A and C do not have formal output contracts with academics.

Table 4-63: Negative consequences – campuses A and B

	How often are there negative consequences if you do not produce research outputs?			
	Campus A		Campus B	
	Count	%	Count	%
Never	55	28.6%	17	20.5%
2	36	18.8%	17	20.5%
3	65	33.9%	23	27.7%
4	15	7.8%	12	14.5%
Always	21	10.9%	14	16.9%
Total	192	100.0%	83	100.0%

Both campus A and B's respondents indicated that there were never negative consequences when they did not produce research outputs.

Campus A: *Cross-tabulation of performance management and gender*

A Chi-square test revealed dependence in gender regarding negative consequences when research outputs are not met (χ^2=10.017; df=4; p=0.040). 67% of male respondents indicated that there were never any negative consequences if they did not produce research results, as opposed to 33% of females. This finding indicates that

female respondents perceived higher levels of negative consequences when they did not produce research results.

Table 4-64: Negative consequences – campus C

Campus C	How often are there negative consequences if you do not produce research outputs?	
	Count	%
Never	12	23.5%
3	10	19.6%
Always	29	56.9%
Total	51	100.0%

In contrast to campus A and B, campus C's respondents indicated that there were always negative consequences when they did not produce research output.

Income generation

Table 4-65: Importance of generating income – campuses A and B

	How important is it that research results are used to generate income for the university/technikon?			
	Campus A		Campus B	
	Count	%	Count	%
Not important at all	8	3.9%	2	2.2%
2	25	12.3%	4	4.4%
3	53	26.1%	23	25.3%
4	68	33.5%	29	31.9%
Very important	49	24.1%	33	36.3%
Total	203	100.0%	91	100.0%

Table 4-66: Importance of generating income – campus C

Campus C	How important is it that research generates income for the university?	
	Count	%
Not important at all	2	3.5%
3	6	10.5%
Very important	49	86.0%
Total	57	100.0%

Campuses A, B and C indicated that it was important for their institution to generate income from research results.

Table 4-67: Long-term impact of income generation – campuses A and B

	In your opinion, what would be the long-term impact on your academic discipline if research results are used to generate income?			
	Campus A		Campus B	
	Count	%	Count	%
Negative impact	24	11.8%	7	7.8%
2	24	11.8%	6	6.7%
3	46	22.7%	19	21.1%
4	59	29.1%	30	33.3%
Positive impact	50	24.6%	28	31.1%
Total	203	100.0%	90	100.0%

Campus A's respondents were undecided about whether the long-term impact of generating income from research results would be negative or positive for their academic disciplines.

Campus B's respondents were more inclined to indicate that there would be a positive impact on their academic disciplines if research results were to be used to generate income.

Campus B: *Cross-tabulation of the long-term impact of research on academic discipline and years of work experience outside of higher education*

Academics with 11 years or more work experience outside of higher education are more positive about the impact that the sale of research results will have on their academic discipline than academics with 0–10 years of experience outside higher education, who indicated that the sale of research could have both a positive as well as a negative impact on their academic discipline: (χ^2=8.290; df=2; p=0.016). Cramer's V value (0.316; p=0.016) indicated a medium relation.

Table 4-68: Long-term impact of income generation – campus C

Campus C	In your opinion, what would be the long-term impact on your academic discipline if research were used to generate income?	
	Count	%
Negative impact	6	10.5%
3	11	19.3%
Positive impact	40	70.2%
Total	57	100.0%

Respondents from campus C clearly felt that using research results to generate income would have a positive impact on their academic discipline.

4.1.11 RESEARCH OUTPUT

Table 4-69: Research output – campus A

Campus A	0 output		1-2 output		3-4 output		5+ output		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%
Scholarly book(s) you authored	153	76.9%	33	16.6%	9	4.5%	4	2.0%	199	100.0%
Scholarly book(s) you edited	169	86.2%	20	10.2%	6	3.1%	1	.5%	196	100.0%
Nationally: Article(s) published in an academic book(s) or journal(s)	80	39.8%	54	26.9%	34	16.9%	33	16.4%	201	100.0%
Internationally: Article(s) published in an academic book(s) or journal(s)	103	51.2%	59	29.4%	18	9.0%	21	10.4%	201	100.0%
Research report(s) written for funded project(s), excluding contract research	154	77.0%	29	14.5%	12	6.0%	5	2.5%	200	100.0%
Research report(s) for privately funded (contract research) project(s)	167	83.9%	25	12.6%	2	1.0%	5	2.5%	199	100.0%
Nationally: Paper(s) presented at a scholarly conference(s)	59	29.4%	66	32.8%	39	19.4%	37	18.4%	201	100.0%
Internationally: Paper(s) presented at a scholarly conference(s)	83	41.5%	70	35.0%	28	14.0%	19	9.5%	200	100.0%
Professional article(s) written for a newspaper(s) or magazine(s)	134	67.0%	38	19.0%	17	8.5%	11	5.5%	200	100.0%
Patent(s) secured on a process or invention(s)	196	98.0%	3	1.5%			1	.5%	200	100.0%
Computer programme(s) written for public use	190	95.0%	9	4.5%			1	.5%	200	100.0%
Video(s), film(s) produced, artefacts or exhibitions	197	99.5%	1	.5%					198	100.0%

The data captured from campus A requested a categorical answer to the number of research outputs. This was not the same on the other two campuses, where respondents were requested to indicate the actual number of research outputs that they produced within the past three years. The data from the three campuses was standardized – refer to section called 'recoding of research output'.

Campus A had the highest level of research outputs as well as the most divergent types of research output of all three campuses.

Table 4-70: Research output – campus B

Campus B	0		1		2		3		4		5		6+		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Scholarly book(s) authored	49	86.0%	7	12.3%	1	1.8%									57	100.0%
Scholarly book(s) edited	53	94.6%	2	3.6%			1	1.8%							56	100.0%
Nationally: Article(s) published in an academic book(s) or journal(s)	52	83.9%	4	6.5%	5	8.1%	1	1.6%							62	100.0%
Internationally: Article(s) published in an academic book(s) or journal(s)	53	82.8%	6	9.4%	3	4.7%	1	1.6%	1	1.6%					64	100.0%
Research report(s) written for funded project(s), excluding contract research	51	83.6%	5	8.2%	4	6.6%	1	1.6%							61	100.0%
Research report(s) for privately funded (contract research) project(s)	54	96.4%	1	1.8%	1	1.8%									56	100.0%
Nationally: Paper(s) presented at a scholarly conference(s)	49	68.1%	9	12.5%	9	12.5%	2	2.8%	2	2.8%	1	1.4%			72	100.0%
Internationally: Paper(s) presented at a scholarly conference(s)	49	71.0%	15	21.7%	1	1.4%	3	4.3%			1	1.4%			69	100.0%
Professional article(s) written for a newspaper(s) or magazine(s)	51	82.3%	6	9.7%	2	3.2%	1	1.6%	2	3.2%					62	100.0%
Patent(s) secured on a process or invention(s)	57	100.0%													57	100.0%
Computer programme(s) written for public use	56	98.2%					1	1.8%							57	100.0%
Video(s), film(s) produced, artifacts or exhibitions	53	82.8%	5	7.8%	2	3.1%	1	1.6%	1	1.6%	1	1.6%	1	1.6%	64	100.0%

The majority of respondents on campus B had not produced any research outputs in the past three years.

Table 4-71: Research output – campus C

Campus C	0		1		2		3		4		5		6+		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Scholarly book(s) authored	58	92.1%	4	6.3%							1	1.6%			63	100.0%
Scholarly book(s) edited	58	92.1%	1	1.6%	3	4.8%			1	1.6%					63	100.0%
Nationally: Article(s) published in an academic book(s) or journal(s)	49	79.0%	6	9.7%	4	6.5%			2	3.2%	1	1.6%			62	100.0%
Internationally: Article(s) published in an academic book(s) or journal(s)	59	93.7%	2	3.2%			1	1.6%			1	1.6%			63	100.0%
Research report(s) written for funded project(s), excluding contract research	56	90.3%	4	6.5%	1	1.6%	1	1.6%							62	100.0%
Research report(s) for privately funded (contract research) project(s)	56	90.3%	2	3.2%	2	3.2%	1	1.6%			1	1.6%			62	100.0%
Nationally: Paper(s) presented at a scholarly conference(s)	46	73.0%	8	12.7%	3	4.8%	2	3.2%	2	3.2%	1	1.6%	1	1.6%	63	100.0%
Internationally: Paper(s) presented at a scholarly conference(s)	53	84.1%	5	7.9%	3	4.8%	1	1.6%	1	1.6%					63	100.0%
Professional article(s) written for a newspaper(s) or magazine(s)	59	95.2%	2	3.2%			1	1.6%							62	100.0%
Patent(s) secured on a process or invention(s)	63	100.0%													63	100.0%
Computer programme(s) written for public use	62	98.4%	1	1.6%											63	100.0%
Video(s), film(s) produced, artifacts or exhibitions	60	95.2%	1	1.6%			1	1.6%			1	1.6%			63	100.0%

The majority of respondents on campus C had not produced any research outputs in the previous three years.

4.1.11.1 Recoding of research outputs

The number of research outputs were recoded because of differences between campus A and the other two campuses' questionnaires. In order to standardize research output, the total number of research outputs across the different categories (or types of research output i.e. videos, journal articles etc.), were added together per respondent. This gives an aggregated number of research outputs per respondent. These were specified in categories of 0 outputs, 1–2 outputs, 3–6 outputs and 7–12 outputs (refer to table 4-72). Research outputs were based on a period of three years (2001–2003).

Table 4-72: Recoded research output cross-tabulation

Campus * Number of different research outputs (recoded) Cross-tabulation

			Number of different research outputs (recoded)				Total
			0	1-2	3-6	7-12	
Campus	Campus C	Count	28	25	10	0	63
		% within campus	44.4%	39.7%	15.9%	.0%	100.0%
	Campus B	Count	31	39	13	0	83
		% within campus	37.3%	47.0%	15.7%	.0%	100.0%
	Campus A	Count	20	42	122	17	201
		% within campus	10.0%	20.9%	60.7%	8.5%	100.0%
Total		Count	79	106	145	17	347
		% within campus	22.8%	30.5%	41.8%	4.9%	100.0%

As illustrated in table 4-72, there is an expectation that 22.8% of the total combined campuses' respondents would have 0 research outputs. However, 44.4% of campus C and 37.3% of campus B's respondents have 0 research outputs. In contrast, there is an expectation that 41.8% of all the combined respondents should have 3–6 research outputs; campus A has 60.7% of respondents producing 3–6 outputs. This confirms that virtually no research activity took place at campus C or campus B, with the majority of research output activity occurring at campus A. In the category 7–12 outputs (very productive researchers), campus A had 8.5% respondents although the expectation was only 4.9% for this number of research outputs for all the campuses combined.

Section 2

4.2 FACTOR ANALYSIS AND RELIABILITY

Both a theoretical and an empirical model exist. A description of the theoretical model is followed by an explanation of the factor analysis that was conducted to derive the empirical model.

4.2.1 THEORETICAL MODEL

The parcels of the theoretical model were derived from the Carnegie Foundation's international survey of the academic profession as well as Teodorescu's correlates of faculty publication productivity survey – both fully described in chapter 2. These two questionnaires were adapted and additional questions were added according to the literature study. Theoretical parcels, as illustrated in the theoretical model, were grouped according to the commonality of issues that were probed in questions (or items) on my study's questionnaires. The theoretical model used in my study is illustrated in figure 4-2. Detail regarding the item grouping of the questionnaire is provided in Appendix II.

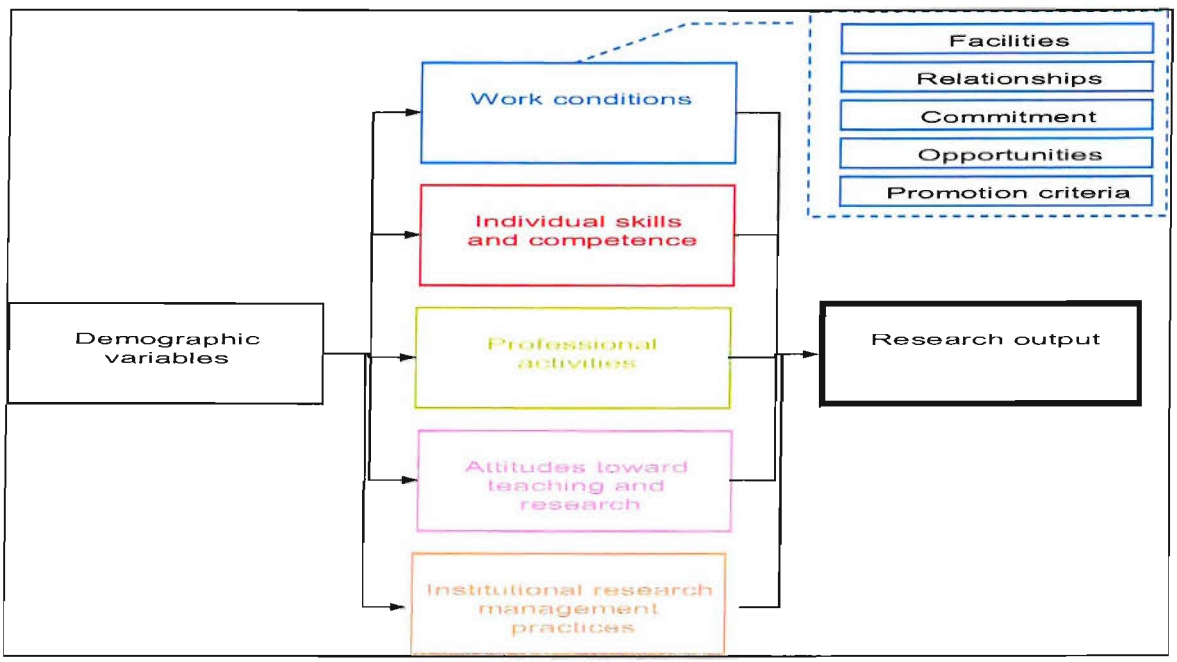


Figure 4-2: Quantitative theoretical model

Table 4-73 provides the reliability calculations of each theoretical parcel. Reliability calculations were not conducted on the parcels 'professional activities' and 'research output' since the data used in these parcels is based on actual research output/professional activity data.

Table 4-73: Reliability of theoretical parcels

Theoretical parcel	Reliability per campus (Cronbach's alpha)			Reliability combined across campuses (Cronbach's alpha)	Number of valid cases per parcel	Number of items per parcel
	Campus A	Campus B	Campus C			
Facilities **(d)**	0.800	0.640	0.751	0.804	**(a)** 92 (25.4%)	9
Relationships **(f)**	0.855	0.812	0.867	0.860	335 (92.5%)	6
Commitment **(f)**	0.806	0.807	0.722	0.822	297 (82%)	9
Opportunities **(f)**	0.650	0.672	0.826	0.711	342 (94.5%)	3
Promotion criteria **(d)**	0.223	0.001	0.013	0.167 **(b)**	324 (89.5%)	4
Individual skills and competence **(f)**	0.771	0.803	0.712	0.786	353 (97.5%)	2
Attitudes toward teaching and research **(d)**	0.127	0.152	0.499	0.190 **(c)**	302 (83.4%)	8
Institutional research management practices **(e) (f)**	0.602	0.666	0.730	0.630	318 (87.8%)	8

Notes to Table 4-73:

a. Although reliability was good at 0.804 for the parcel 'Facilities', there were too few valid cases (number of respondents that responded to all the items), namely 92 or 25.4% – to render the data usable for further regression analyses. When the parcel was excluded during regression analysis, the total number of valid items increased from 62 to 216.

b. Questions in the parcel 'Promotion criteria' contained one question that probed opinion and three questions that focused on actual fact. The differences in the purposes of these questions and the small number of items (namely 4) influenced reliability negatively.

c. The parcel 'Attitudes toward teaching and research' covered too many varied issues. Furthermore, the items had variance in interpretation and were therefore not unidirectional in meaning. This rendered a poor reliability.

d. Parcels 'Facilities', 'Promotion criteria' and 'Attitudes toward teaching and research', based on the above, were excluded from the calculations of the CHAID and regression analyses.

e. The Cronbach alpha coefficient of 0.630 for 'Institutional research management practices' is deemed reliable, since the parcel measured four different sub-constructs (refer to Appendix II), each with two items. Items should contain proper variance to contribute to the reliability of a test (Schepers, 1992, p. 28) and the fact that there were only two items per sub-construct contributed to low, but acceptable, reliability. Further testing of this parcel should be done.

f. These theoretical parcels were deemed reliable.

The theoretical model therefore changed to reflect parcels as indicated in figure 4-3.

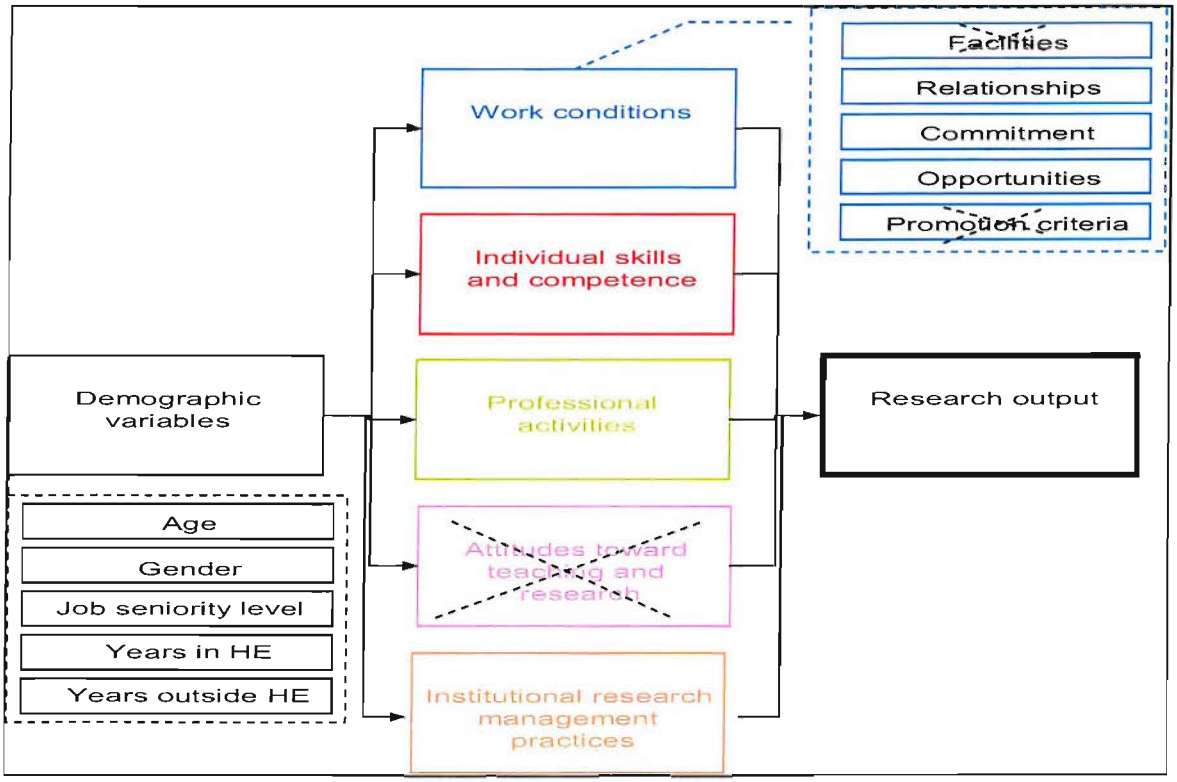


Figure 4-3: Quantitative theoretical model adapted after reliability calculations

4.2.2 FACTOR ANALYSIS: EMPIRICAL MODEL

Although the questionnaires were based on a theoretical model, a factor analysis was conducted to determine whether an empirical model could be derived from the data. The factor analysis therefore disregards the theoretical parcels and deals with the data set as a whole to derive a statistical model from the respondents' data. Before a factor

analysis could proceed, two tests were done, namely the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Item descriptive statistics are presented in Appendix III.

42 items (Q2-Q27), as displayed in Appendix III, were inter-correlated. Items Q11 and Q25 were discarded since their MSA values were < 0.5. The KMO and Bartlett tests indicated that the item inter-correlation matrix would allow for a factor analysis – refer to table 4-74.

Table 4-74: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure (KMO) Measure of Sampling Adequacy (MSA)		.767
Bartlett's Test of Sphericity	Approx. Chi-Square	3257.946
	Df	861
	Sig. p-value	.000

4.2.2.1 First level factor analysis

A first level factor analysis, using the Principal Axis Factoring Extraction method utilizing the Varimax Rotation with Kaiser Normalization, was conducted. Next Eigen values were calculated – refer to table 4-75.

Table 4-75: First level analysis: Total Variance Explained

Total Variance Explained									
Factor	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.928	16.495	16.495	6.509	15.499	15.499	3.229	7.687	7.687
2	2.986	7.110	23.605	2.568	6.114	21.613	3.201	7.622	15.309
3	2.886	6.872	30.477	2.444	5.818	27.431	2.128	5.067	20.376
4	2.577	6.135	36.612	2.135	5.083	32.514	1.702	4.053	24.430
5	2.118	5.044	41.656	1.655	3.940	36.454	1.604	3.820	28.250
6	1.628	3.876	45.532	1.178	2.806	39.260	1.592	3.791	32.041
7	1.528	3.638	49.170	1.043	2.484	41.744	1.447	3.446	35.487
8	1.330	3.167	52.337	.854	2.034	43.778	1.437	3.420	38.907
9	1.298	3.092	55.429	.799	1.902	45.680	1.217	2.899	41.806
10	1.211	2.884	58.313	.778	1.852	47.532	1.177	2.802	44.608
11	1.099	2.618	60.931	.634	1.510	49.042	1.073	2.555	47.163
12	1.066	2.539	63.470	.584	1.390	50.433	1.054	2.509	49.672
13	1.037	2.469	65.939	.560	1.334	51.766	.796	1.895	51.567

Total Variance Explained

Factor	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
14	1.011	2.407	68.346	.499	1.187	52.953	.582	1.386	52.953
15	.919	2.189	70.534						
16	.821	1.955	72.489						
17	.803	1.911	74.400						
18	.766	1.823	76.223						
19	.736	1.753	77.976						
20	.689	1.641	79.617						
21	.670	1.596	81.212						
22	.602	1.434	82.646						
23	.593	1.411	84.057						
24	.570	1.358	85.415						
25	.528	1.258	86.673						
26	.492	1.171	87.845						
27	.482	1.147	88.991						
28	.455	1.083	90.074						
29	.436	1.038	91.112						
30	.395	.940	92.052						
31	.381	.906	92.958						
32	.361	.859	93.817						
33	.336	.799	94.616						
34	.328	.782	95.398						
35	.309	.736	96.134						
36	.288	.686	96.820						
37	.268	.638	97.458						
38	.258	.614	98.072						
39	.230	.548	98.619						
40	.211	.501	99.121						
41	.197	.470	99.591						
42	.172	.409	100.000						

Extraction Method: Principal Axis Factoring.

The number of postulated factors, based on the number of Eigen values larger than unity, was 14. These 14 postulated factors, with respective item loadings, are presented in table 4-76.

Table 4-76: First order analysis: Rotated Factor Matrix

Rotated Factor Matrix(a) (a) Rotation converged in 24 iterations.
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.

	Factor													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Q8C	.762	.203							.169	.112				
Q8G	.671			.137		.205			.108			.227	.247	
Q8H	.627	.294			-.117		.141						.108	.110
Q8A	.572	.295	-.136											
Q8I	.564	.228		.159	-.168			.129	.226		.175		.114	
Q8B	.488				.135		-.177	-.102	.462	.182				-.220
Q4D	.302	.786	.141						.122				-.104	-.107
Q4C	.115	.748									.123		.107	-.184
Q4B	.146	.717	.143	.107							.137	-.150	.123	
Q4E	.267	.630						.206						.268
Q4A	.422	.525	.154			-.171				.117	.121	.116		.255
Q4G	.356	.424	.168	.111							.111		.226	.122
Q20			.827							.106				
Q19		.117	.702		.142									
Q21	-.125	.142	.679		.154	-.149		.110	.143					
Q24			.423	.156		-.146		.110		-.115		.251	.199	
Q14	.149			.706	.119									
Q13	.148	.163		.697	.124									
Q17		.270	.215	.422					.195		.313			
Q18E			.155	.392			.133	.133			-.120			
Q18G	.158			.244		.175	.214	.213		.198		.113		-.219
Q16			.155	.151	.771					.137				
Q15		-.101			.761	.196			-.140		.116			
Q18A		.104		.121	.147	.653				.191	.382	-.124		
Q18D					-.196	-.644			.180	.204		.108		
Q5			.122			-.544			-.121			-.400		
Q26							.867					.104		
Q27							.541		.111	-.148		.155		
Q12					-.237	-.285	.294	.133		.187		.152	.194	
Q23		.180						.738						
Q22			.144	.195		-.104		.720			.107	.131		
Q8D	.201	.132	.123	.127					.543				.157	
Q8E	.307						.129		.485					.122
Q2	.168	.136			.263			-.117	-.267		.110	.257	.214	
Q18B	.180									.716				
Q18C		-.130								.521	-.186			.143
Q9		.116			.100	.103		.164		-.153	.570	.205		-.159
Q10		.164			.115	.163					.491			.123

Q7					.110	.218	-.234					-.502		
Q6				-.144			-.177	-.144				-.437		
Q8F	.200	.241							.254				.641	
Q18F	.150			.141		.103		.246	.133	.165				.380

4.2.2.2 Second Level Factor Analysis

Sub-scores were calculated for the 14 first level factors and were inter-correlated. An Anti-image correlation indicated that first level factors 5, 6 and 10 lacked measures of sampling adequacy (KMO < 0.4). These factors were discarded.

The KMO and Bartlett's tests were conducted on the sub-scores matrix and this was deemed suitable for further analysis (KMO =0.703) – refer to table 4-77.

Table 4-77: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure (KMO) Measure of Sampling Adequacy (MSA)		.703
Bartlett's Test of Sphericity	Approx. Chi-Square	391,490
	Df	55
	Sig.	.000

Next, Eigen values were calculated on the inter-correlation matrix of the remaining sub-scores – refer to table 4-78.

Table 4-78: Second order analysis: Total variance explained

Factor	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings(a)
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.837	25.794	25.794	2.262	20.560	20.560	1.998
2	1.474	13.400	39.193	.870	7.913	28.473	.896
3	1.208	10.981	50.175	.548	4.981	33.455	1.568
4	.986	8.961	59.135				
5	.937	8.520	67.655				
6	.801	7.285	74.940				
7	.700	6.364	81.304				
8	.638	5.800	87.104				
9	.582	5.288	92.391				
10	.498	4.529	96.920				
11	.339	3.080	100.000				
Extraction Method: Principal Axis Factoring.							
a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.							

For the second level factor analysis, a Principal Axis Factoring Extraction method utilizing the Oblimin with Kaiser Normalization was conducted. The number of second level postulated factors, based on the number of Eigen values larger than unity, was 3. These 3 postulated factors are presented in table 4-79.

Table 4-79: Second level analysis: Pattern Matrix(a)

Pattern Matrix(a)			
	Factor		
	1	2	3
FACTOR 1.1 (Q8 - A, B, C, G, H, I)	.758	.127	
FACTOR 1.9 (Q8D, Q8E, Q2)	.694	-.177	-.133
FACTOR 1.2 (Q4 – A, B, C, D, E, G)	.543	.297	.382
FACTOR 1.13 (Q8F)	.453		
FACTOR 1.11 (Q9, Q10)	.202		.138
FACTOR 1.7 (Q12, Q26, Q27)		-.588	
FACTOR 1.12 (Q6, Q7)		.556	
FACTOR 1.8 (Q22, Q23)	-.138	-.105	.623
FACTOR 1.4 (Q13, Q14, Q17, Q18E, Q18G)	.165		.478
FACTOR 1.3 (Q19, Q20, Q21, Q24)			.436
FACTOR 1.14 (Q18F)			.262
Extraction Method: Principal Axis Factoring. Rotation Method: Oblimin with Kaiser Normalization.			
(a) Rotation converged in 7 iterations.			

The three factors that are presented in table 4-79 were labelled as follows:

- Factor 1: Intangible factors (general organizational climate);
- Factor 2: Alienation factors; and
- Factor 3: Tangible factors (directly related to research).

Table 4-80: Second level analysis: Factor Correlation Matrix

Factor Correlation Matrix			
Factor	1	2	3
1	1.000	-.116	.431
2	-.116	1.000	-.226
3	.431	-.226	1.000
Extraction Method: Principal Axis Factoring. Rotation Method: Oblimin with Kaiser Normalization.			

From the correlation matrix presented in table 4-80 it can be deduced that Factor 1 and Factor 3 are strongly correlated. Factor 2 correlates negatively with both Factors 1 and 3.

4.2.3 RELIABILITY OF EMPIRICAL MODEL

In order to determine the reliability of the three factors that were extracted by the factor analysis, the Cronbach alpha calculation was done. Reliability of the factors 'Intangible factors' (Cronbach alpha = 0.851, table 4-81) and 'Tangible factors' (Cronbach alpha = 0.744, table 4-83) was acceptable.

4.2.3.1 Reliability Factor 1: Intangible factors

Table 4-81: Item – Total Statistics: Factor 1 – Intangible factors

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's alpha if Item Deleted
A safe and secure working environment	57.87	105.633	.583	.837
Opportunity to network nationally and internationally	57.92	108.178	.538	.840
Academic reputation of institution	57.86	107.329	.615	.837
Physical resources and infrastructure	58.41	108.475	.468	.843
Opportunity to realize personal goals	57.90	106.238	.585	.837
Flexible workplace arrangements e.g. can work from home	57.79	109.148	.405	.846
Relationships between academics and university management	58.77	106.193	.622	.836
Relationships between academics and faculty management	58.50	108.837	.530	.840
Relationships between the academics and departmental management	58.20	108.664	.524	.840
Academic morale e.g. positive attitude	58.77	107.213	.611	.837
The intellectual atmosphere e.g. academic standards and status of the institution	58.30	108.033	.604	.837
Your sense of belonging	58.36	107.349	.561	.838
Family commitments	58.18	112.882	.298	.850
Opportunity to earn extra income	58.53	111.310	.335	.849
To what extent do you integrate your research findings with your teaching activities?	58.01	115.040	.176	.857
To what extent do you agree with the following statement: A good research supervisor is a good researcher?	58.00	114.831	.214	.854
To what extent do you agree with the following statement: A good researcher is a good research supervisor?	58.62	113.820	.238	.854

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's alpha if Item Deleted
Social relationships at work	58.23	111.344	.391	.846

Scale Statistics				
Mean	Variance	Std. Deviation	N of Items	Cronbach alpha
61.66	121.663	11.030	18	0.851

4.2.3.2 Reliability Factor 2: Alienation factors

The reliability of the factor 'Alienation factors' was low (alpha Cronbach = 0.553) – refer to table 4-82. This was largely due to a mixture of opinion and factual information questions as well as a low number of items. The factor 'Alienation factors' was therefore not taken into consideration in the final empirical model.

Table 4-82: Item-Total Statistics: Factor 2 – Alienation factors

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's alpha if Item Deleted
How important is it that research results are used to generate income for the university?	14.7849	8.263	.464	.414
In your opinion, what would be the long-term impact on your academic discipline if research results are used to generate income?	15.0203	8.510	.290	.514
Indicate what, in your view, constitutes meaningful research?	15.0465	9.794	.251	.531
To what extent do you believe that an academic career can be community service free?	15.0698	8.327	.310	.502
To what extent do you believe that an academic career can be teaching free?	14.5552	8.930	.279	.518

Scale Statistics				
Mean	Variance	Std. Deviation	N of Items	Cronbach alpha
18.6192	12.318	3.50972	5	.553

4.2.3.3 Reliability Factor 3: Tangible factors

Table 4-83: Item-Total Statistics: Factor 3 – Tangible factors

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's alpha if Item Deleted
How informed are you about your faculty's/division's research performance relative to that of other faculties/divisions at your institution?	32.03	44.175	.476	.714
How informed are you about your institution's research performance relative to that of other academic institutions?	32.04	43.759	.475	.713
How much do you know about your faculty's/division's research policy?	31.77	44.581	.452	.717
How specifically have research outputs been contracted with you?	32.51	45.913	.369	.728
To what extent is there opportunity to get involved in research across institutions? (inter-institutional)	31.77	46.625	.370	.727
To what extent is there opportunity to get involved in research across academic disciplines at your institution? (interdisciplinary)	31.78	46.167	.421	.722
How many research opportunities are there at your institution where you can hone your research skills?	31.71	45.381	.430	.720
Research funding in my field is easier to get now than it was five years ago	31.90	47.278	.315	.734
An academic's international network is important in his/her evaluation at this institution	31.33	47.619	.290	.737
How important are research focus areas for the university's research functioning?	31.14	47.922	.312	.734
How important are research focus areas for your department's/division's research functioning?	31.34	45.867	.379	.726
Contract research in exchange for a fee is valued at this institution	32.01	49.189	.215	.745

Scale Statistics				
Mean	Variance	Std. Deviation	N of Items	Cronbach alpha
34.67	53.736	7.331	12	.744

Based on the factor analysis and the reliability calculations, the empirical model can therefore be illustrated as depicted in figure 4-4.

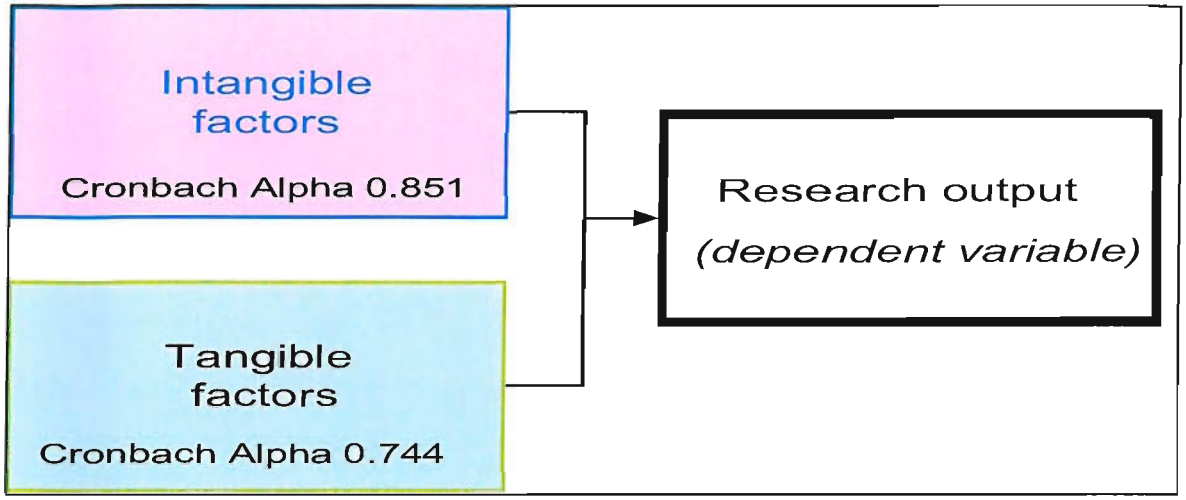


Figure 4-4: Empirical model

Both the theoretical and empirical models were used in the inferential statistics section to determine the prediction value of research output.

Section 3

4.3 INFERENTIAL STATISTICS

In this section both the theoretical and empirical models were used in calculations to determine which factors predict the dependent variable 'Research output'.

4.3.1 THEORETICAL MODEL

One-way analysis of variance using a single theoretical parcel as predictor of research output was conducted first. This was followed by a CHAID as well as a regression analysis. With the latter analyses the full theoretical model with multiple theoretical parcels was used. The theoretical model that was used for calculations in this section was refined after reliability calculations (as discussed in the second section of this chapter) and is represented in figure 4-5. Finally, a theoretical research output prediction model was derived.

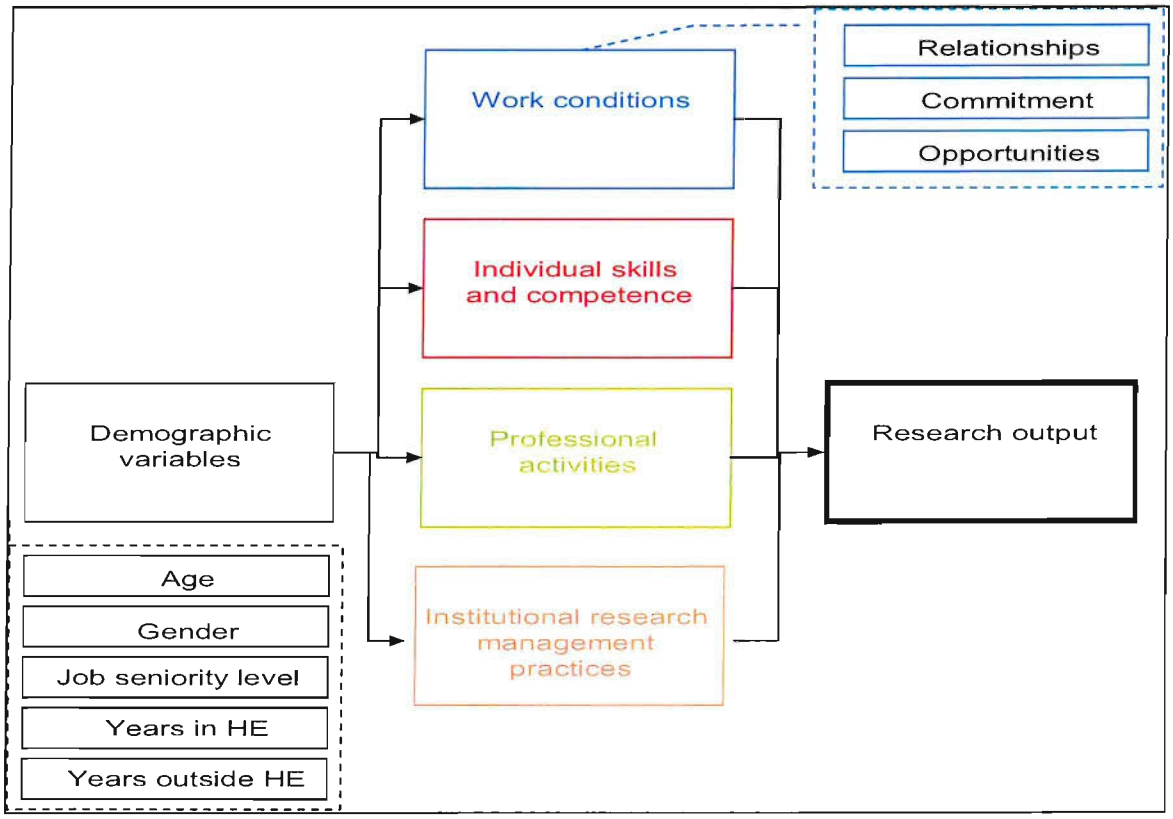


Figure 4-5: Refined theoretical model

4.3.1.1 Calculations of single predictors of research output

Single theoretical parcels of grouped items were used in a one-way analysis to determine whether, on its own, each parcel had any effect on research output (data combined across campuses). Chi-square tests were used for the demographic variables and a one-way ANOVA was used for the other theoretical parcels in figure 4-5. The results of these tests cannot be generalized to any other level and therefore a CHAID and a regression analysis was conducted afterwards.

4.3.1.2 Chi-square tests

Age, on its own, influenced research output, in that researchers up to 39 years of age accounted for low research output and researchers 40+ years accounted for higher research output (χ^2=26.625; df=9; p=0.002 with Cramer's V = 0.160 indicating a small relation) – see table 4-84. This is the same as the South African national trend.

Table 4-84: Cross tabulation of Age and Research output

			Age				Total
			Younger than 30	30-39 years	40-49 years	50 and older	
Number of different research projects	0	Count	19	23	24	13	79
		% within Number of different research projects	24.1%	29.1%	30.4%	16.5%	100.0%
	1-2	Count	25	27	32	22	106
		% within Number of different research projects	23.6%	25.5%	30.2%	20.8%	100.0%
	3-4	Count	9	17	35	24	85
		% within Number of different research projects	10.6%	20.0%	41.2%	28.2%	100.0%
	5-9	Count	2	18	30	25	75
		% within Number of different research projects	2.7%	24.0%	40.0%	33.3%	100.0%
Total		Count	55	85	121	84	345
		% within Number of different research projects	15.9%	24.6%	35.1%	24.3%	100.0%

Years employed in HE, on its own, indicated that respondents who have not been employed in the HE sector for more than 10 years have a low research output. The respondents who have been employed in HE for more than 10 years have a high research output (χ^2=47.773; df=9; p=0.000 with Cramer's V = 0.216 indicating a small relation).

Table 4-85: Cross tabulation of Job seniority and Research output

			What is your current job seniority level?				Total
			Junior lecturer	Lecturer	Senior lecturer	Professor /departmental chairperson	
Number of different research projects	0	Count	15	33	19	10	77
		% within Number of different research projects	19.5%	42.9%	24.7%	13.0%	100.0%
	1-2	Count	15	45	23	22	105
		% within Number of different research projects	14.3%	42.9%	21.9%	21.0%	100.0%
	3-4	Count	1	25	21	39	86
		% within Number of different research projects	1.2%	29.1%	24.4%	45.3%	100.0%
	5-9	Count	2	6	13	55	76
		% within Number of different research projects	2.6%	7.9%	17.1%	72.4%	100.0%
Total		Count	33	109	76	126	344
		% within Number of different research projects	9.6%	31.7%	22.1%	36.6%	100.0%

Job seniority level (table 4-85), on its own, indicated that the professorial level (most senior level) was indicative of high research output. All levels below professorial level related to low research output (χ^2=89.782; df=9; p=0.000 with Cramer's V = 0.295 indicating a small relation – although the relation is nearly at 0.3, which indicates a medium relation).

4.3.1.3 One-way ANOVA

The purpose of using a one-way ANOVA calculation was to determine which theoretical parcel/s in the final theoretical model (refer to table 4-86) predicts research output.

Table 4-86 presents the ANOVA statistics. 'Commitment' (F=4.137; df1=3; df2=283; p=0.007), 'Individual skills and competence' (F=38.5, df1=3; df2=335; p=0.000) and 'Professional activities' (F=57.209, df1=3; df2=250; p=0.000) significantly predict research output and therefore the null hypothesis is rejected.

Table 4-86: Theoretical parcels ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Parcel: Relationships	Between Groups	3.257	3	1.086	1.566	.198
	Within Groups	221.140	319	.693		
	Total	224.397	322			
Parcel: Commitment	Between Groups	6.657	3	2.219	4.137	.007
	Within Groups	151.781	283	.536		
	Total	158.438	286			
Parcel: Opportunities	Between Groups	3.646	3	1.215	1.414	.239
	Within Groups	280.287	326	.860		
	Total	283.933	329			
Parcel: Individual skills and competence	Between Groups	83.003	3	27.668	38.500	.000
	Within Groups	240.746	335	.719		
	Total	323.749	338			
Parcel: Institutional research management practices	Between Groups	1.194	3	.398	.933	.425
	Within Groups	130.086	305	.427		
	Total	131.280	308			
Parcel: Professional activities	Between Groups	2438.367	3	812.789	57.209	.000
	Within Groups	3551.858	250	14.207		
	Total	5990.224	253			

In summary, the one-way analyses of variance, using a single theoretical parcel as predictor of research output, indicated that:

- 'Age';
- 'Years employed in HE';

- 'Job seniority level';
- 'Commitment';
- 'Individual skills and competence'; and
- 'Professional activities'

were the only theoretical parcels that significantly predicted research output.

4.3.1.4 CHAID analysis

A CHAID analysis was conducted to study the relationship between research output and the theoretical parcels. In order for the CHAID analysis to provide a clearer prediction profile, and as a result of the low number of valid responses, the research output categories were collapsed into two categories, namely 0–2 outputs and 3–9 outputs.

4.3.1.5 Combined CHAID analysis

In figure 4-6 the CHAID diagram illustrates that the two research output categories are nearly equal in size (53.31% and 46.69%). The first theoretical parcel that most significantly predicts research output is 'Professional activities', with a prediction value of 83.46% for the '>5 professional activities involved in' category. In the '<missing>values' category the CHAID diagram predicts that, of those respondents who did not complete information regarding their research output, 70.97% would fall into the 0–2 research output category. Within the output category '>5 professional activities involved in' (high professional activity), the theoretical parcel 'Individual skills and competence' was the most significant predictor of research output, with a 94.52% prediction rate for those respondents who indicated that they have a high level of skills and competence (>4 category).

This means that those respondents who feel that they are highly skilled and competent in research output were also the respondents who were very active in professional activities (>5 activities), and these theoretical parcels were the most significant predictors of research output out of all the theoretical parcels.

Of importance is the fact that the CHAID analysis was conducted one way. The theoretical parcel 'Professional activities' could also have a two-way influence due to the fact that researchers who have high research output are invited to present their

research findings at many professional conferences and therefore the fact that they are very active professionally could also be due to the fact that they have a high research output.

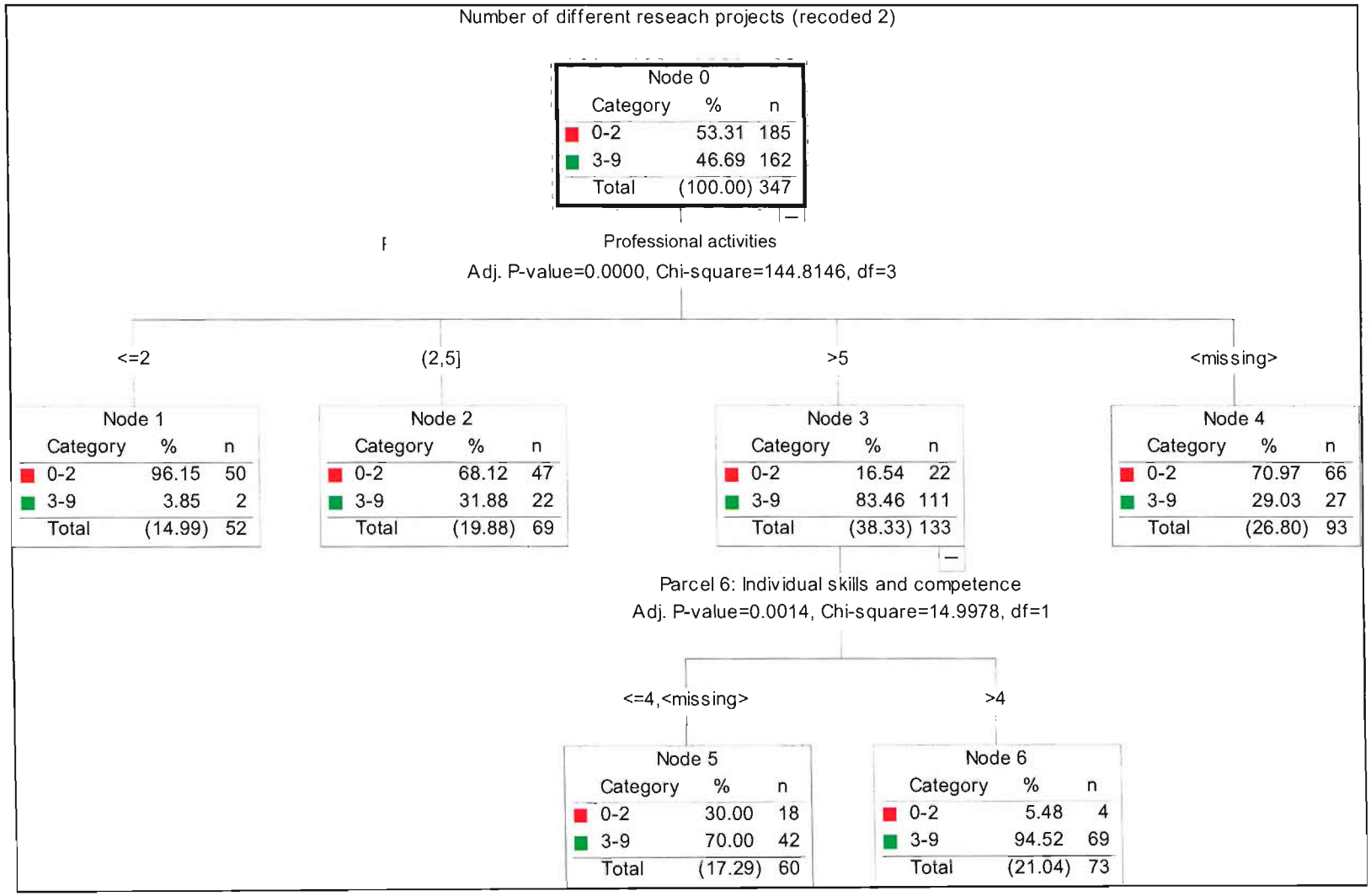


Figure 4-6: CHAID – all variables (including demographic variables)

4.3.1.6 CHAID analysis excluding demographic variables

A second CHAID analysis was conducted based on the theoretical parcels:

- Relationships;
- Commitment;
- Opportunities;
- Individual skills and competence;
- Professional activities; and
- Institutional research management practices –

excluding the demographic variables. The analysis yielded the same results as the first analysis, with 'Professional activities' and thereafter 'Individual skills and competence' as the most significant predictors of high research output.

4.3.1.7 CHAID analysis of demographic variables

A third CHAID analysis, excluding the above theoretical parcels and using only demographic variables as illustrated in figure 4-5, yielded a result that 'Job seniority level' was the most significant predictor of research output. Figure 4-7 illustrates that senior job levels predict 74.6% of high research output (3–9 research outputs) and junior job levels predict 76.55% of low research output (0–2 research output).

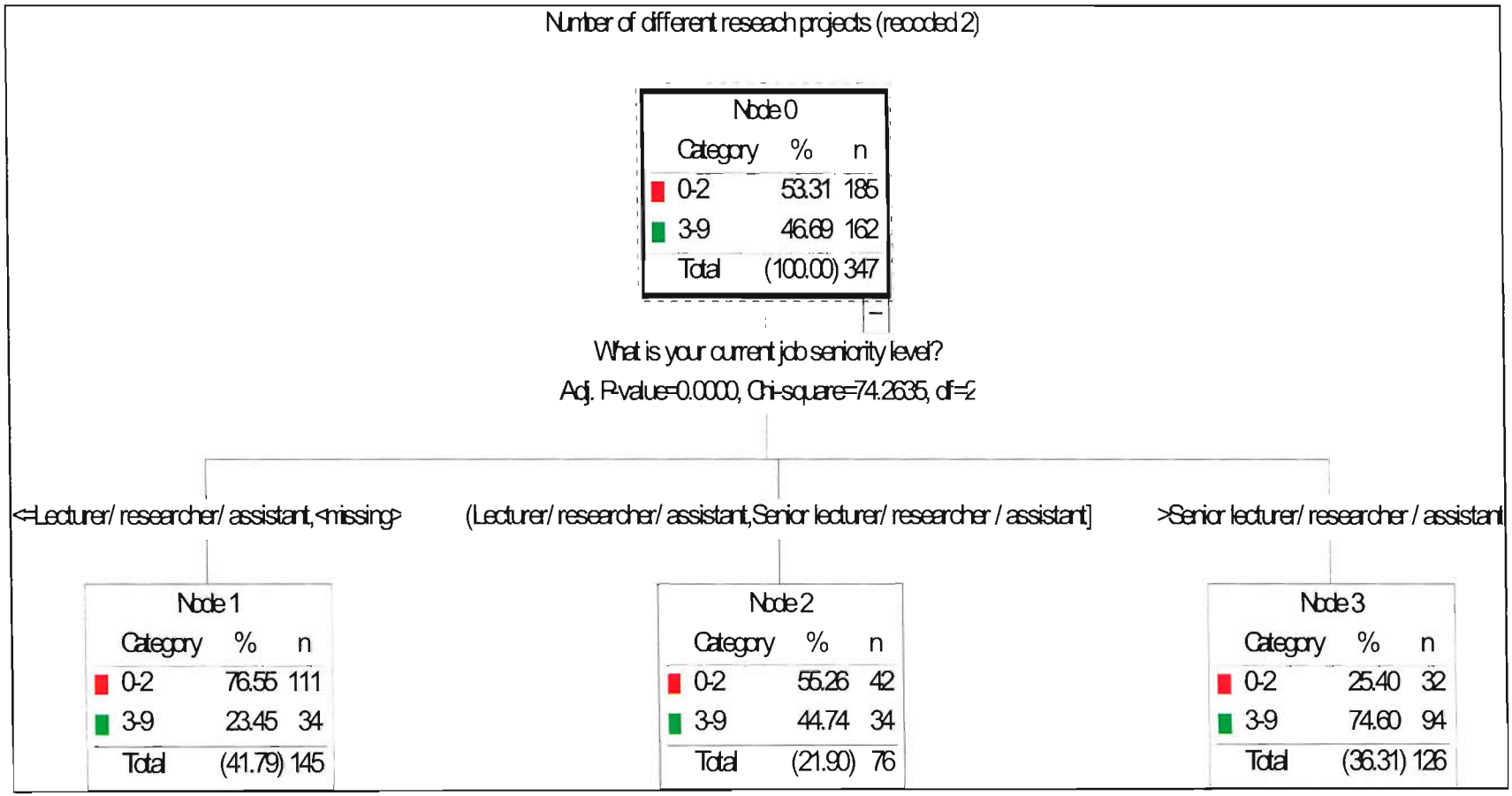


Figure 4-7: CHAID – all demographic variables excluding other theoretical parcels

4.3.1.8 Regression analysis – theoretical model

As a result of the low n-count, and in order to verify the CHAID analysis, a binary logistic regression analysis using 'Research output' as the dependent variable, was conducted. The analysis was conducted using a Forward Stepwise (Wald) regression analysis, where at each step the variable that minimizes the overall Wilks's Lambda is entered. The theoretical parcels in figure 4-5 were entered into the regression analysis (table 4-87).

Table 4-87: Case processing summary

Case Processing Summary		N	Marginal Percentage
Number of different research outputs	0	29	18.5%
	1–2	38	24.2%
	3–4	42	26.8%
	5–12	48	30.6%
Gender	Male	61	38.9%
	Female	96	61.1%
Age	Younger than 30	23	14.6%
	30–39 years	34	21.7%
	40–49 years	59	37.6%
	50 and older	41	26.1%
How many years, in total, have you been employed IN higher education?	Less than 5 years	24	15.3%
	5–9	42	26.8%
	10–19	50	31.8%
	20 or more years	41	26.1%
How many years, in total, have you been involved in professional work OUTSIDE of higher education?	Less than 5 years	61	38.9%
	5 years or more	96	61.1%
What is your current job seniority level?	Junior lecturer/ researcher/ assistant	16	10.2%
	Lecturer/ researcher/ assistant	45	28.7%
	Senior lecturer/ researcher / assistant	28	17.8%
	Professor /departmental chairperson /divisional head	68	43.3%
Valid		157	100.0%
Missing		205	
Total		362	
Subpopulation		157(a)	
The dependent variable has only one value observed in 157 (100.0%) subpopulations.			

Notes to Table 4-87

(a) As a result of the fact that there are only 157 valid items, a binary logistic regression analysis was conducted. Two categories of research output were used, namely 0–2 outputs and 3–12 outputs (based on original recoded outputs in table 4-72).

Block 1 of the Forward Stepwise (Wald) calculation selected two parcels. In the first step 'Professional activities' was selected and in the second step 'Individual skills and competence' was selected (refer to table 4-88).

Table 4-88: Stepwise calculation – theoretical model

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	Professional activities	.529	.085	38.909	1	.000	1.696
	Constant	-2.754	.488	31.817	1	.000	.064
Step 2(b)	Individual skills and competence	.845	.297	8.117	1	.004	2.329
	Professional activities	.477	.087	29.976	1	.000	1.611
	Constant	-5.697	1.229	21.500	1	.000	.003
(a) Variable(s) entered on step 1: Professional activities							
(b) Variable(s) entered on step 2: Individual skills and competence							

The overall prediction percentage of both steps is 83.4% (refer to table 4-89). This means that both 'Professional activities' and 'Individual skills and competence' have high prediction value of the dependent variable 'Research output'. The regression analysis thus confirms the findings of the CHAID analysis. Furthermore, 'Individual skills and competence' is relatively uncorrelated with 'Professional activities', which means that both independently predict research output.

Table 4-89: Prediction values – theoretical model

Classification Table(a)					
	Observed		Predicted		
			Number of different research outputs (recoded 2)		Percentage Correct
			0-2	3-12	
Step 1	Number of different research outputs	0-2	56	11	83.6
		3-12	15	75	83.3
	Overall Percentage				83.4
Step 2	Number of different research outputs	0-2	56	11	83.6
		3-12	15	75	83.3
	Overall Percentage				83.4
(a) The cut value is .500					

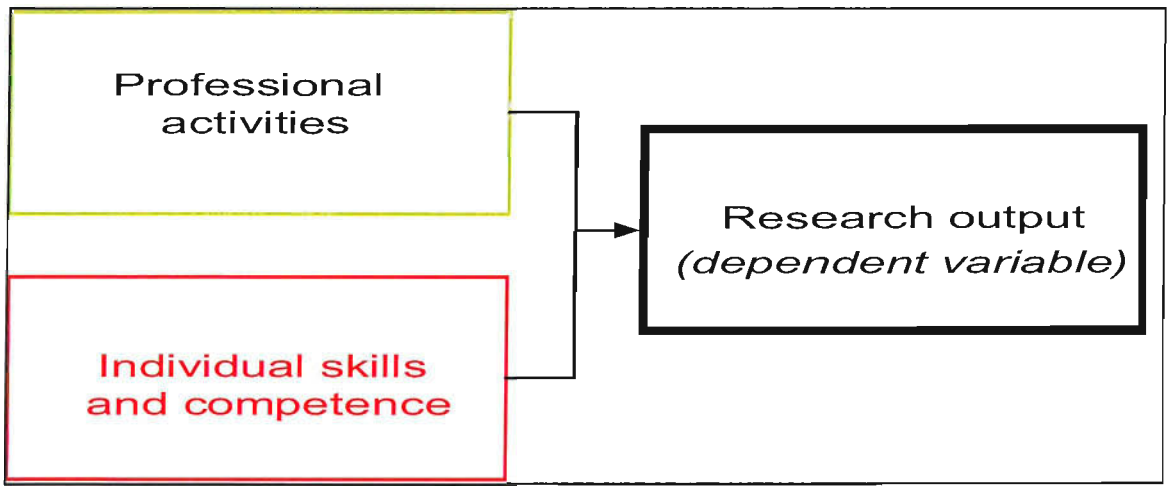


Figure 4-8: Theoretical research output prediction model

A theoretical prediction model that best predicts the dependent variable 'Research output' is presented in figure 4-8.

4.3.2 EMPIRICAL MODEL

A binary logistic regression analysis using 'Research output' as the dependent variable was conducted, in which the two factors of the empirical model were entered (refer figure 4-90). The analysis was conducted using a Forward Stepwise (Wald) statistical analysis, where at each step the variable that minimizes the overall Wilks's Lambda is entered. Table 4-90 provides a summary of actual cases.

Table 4-90: Case processing summary

	Observed		Predicted		
			Number of different research outputs (recoded)		Percentage Correct
			0	7-12	
Step 0	Number of different research outputs (recoded)	0	35	0	100.0
		7-12	15	0	.0
	Overall Percentage				70.0
(a) Constant is included in the model.					
(b) The cut value is .500					

Block 1 of the Forward Stepwise (Wald) calculation selected one factor. 'Tangible factors' was selected (refer to table 4-91).

Table 4-91: Stepwise calculation – empirical model

Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1(a)	FACTOR 3 Tangible factors	1.620	.658	6.059	1	.014	5.052
	Constant	-5.746	2.061	7.773	1	.005	.003
(a) Variable(s) entered on step 1: FACT2.3.							

The overall prediction percentage of research output for the factor 'Tangible factors' is 74% (refer to table 4-92).

Table 4-92: Prediction values – empirical model

	Observed		Predicted		
			Number of different research outputs (recoded)		Percentage Correct
			0	7-12	
Step 1	Number of different research outputs (recoded)	0	32	3	91.4
		7-12	10	5	33.3
	Overall Percentage				74.0
(a) The cut value is .500					

The implication of the findings in table 4-92 is that the factor 'Tangible factors' predicts research output better for non-research-active academics (91.4% correct prediction rate – 0 research outputs category) than for the research-active academics (33.3% correct prediction rate for the 7–12 research outputs category). Therefore, the research output of the active researchers is predicted by factors, not reflected in the equation, other than the 'Tangible factors'.

In conclusion, the theoretical parcels 'Professional activities' and 'Individual skills and competence' had an overall prediction rate of 83.4% (refer to table 4-89). In contrast, the empirical factor 'Tangible factors' had an overall prediction rate of 74%. This means that, depending on the model used, all of these factors have a high prediction value in relation to the dependent variable 'Research output'.

Conclusion

This concludes chapter 4, in which the findings of the quantitative results derived from the questionnaires were presented. The findings were grouped into three sections, namely descriptive statistics, factor analysis and reliability calculations, and inferential statistics.

In the first section of the chapter a theoretical model is used for the sequencing of descriptive statistics. Descriptive statistics are presented to indicate the frequencies of responses for each of the theoretical model parcels as well as to distinguish between frequencies for the three campuses through Chi-square calculations. Descriptive statistics furthermore include:

- recoding of professional activities; and
- recoding of research output.

The second section contains reliability calculations to verify the theoretical model (figure 4-3) and a factor analysis with reliability calculations of an empirical model (figure 4-4). For the theoretical model, three parcels showed low reliability and were consequently not included in the final model.

In order to derive an empirical model a factor analysis was conducted. The first level factor analysis derived 14 postulated factors. The second level factor analysis postulated 3 factors. After completion of reliability calculations, the final empirical model had 2 factors namely 'Tangible factors' and 'Intangible factors'.

In the third section, both the theoretical and the empirical models were tested for factors that best predict research output. For the theoretical model, a CHAID analysis indicated that 'Professional activities' (83.46%) and 'Individual skills and competence' (94.52%) had the highest prediction values for predicting high 'Research output'

Due to the low n-count, and in order to verify the CHAID analysis, a binary logistic regression analysis using 'Research output' as the dependent variable, based on the

theoretical model, was conducted. The regression analysis confirmed the findings of the CHAID analysis. A final theoretical research output prediction model is provided in figure 4-8.

For the empirical model, a regression analysis was conducted to determine which of its two factors predicted research output. The factor 'Tangible factors' was the most significant predictor of research output (74%) for non research active academics.