THE EFFECT OF THE RESEARCH COMPONENT OF THE SOUTH AFRICAN HIGHER EDUCATION SUBSIDY FORMULA ON KNOWLEDGE PRODUCTION: 2001 - 2006

by

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Contents

ABSTRACT

Government policies on subsidising higher education institutions may have a direct impact on the behaviour of researchers and managers respectively. Therefore, this thesis looks for clues on how higher education institutions respond to the government funding policies, with special reference to the New Funding Framework (NFF) introduced in South Africa in 2001. The funding framework specified that research funding would be determined only on the basis of research output. The NFF puts emphasis on the number of publications produced by higher education institutions per annum to determine their subsidy amounts. Governments use quantitative formulas to allocate research funds to higher education institutions based on their production of output. The current South African funding framework is arguably consistent with some international suggestions of the role that government funding can play in the implementation of national higher policies.

This thesis uses higher education research output as a measure of knowledge production. As such, the thesis was set out to determine the effects that the research subsidy component of the NFF might have had on South African public higher education institutions' knowledge production between 2001 and 2006. The thesis argues that the subsidy component of the NFF has had positive effects on the knowledge production of South African public higher education institutions (HEIs). An empirical analysis of the output trends of South African HEIs for the period under review has shown a steady increase, more especially from 2003. The thesis attributes the new trend in higher education research output to the successful implementation of the NFF. It is thus concluded that considering the output trends of the period under review, the implementation of the NFF is yielding positive effects towards achieving its intended goal of increasing research output of South African public HEIs.

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DECLARATION

I hereby declare that the research titled "**The effect of the research component of the South African higher education subsidy formula on knowledge production: 2001-2006**" is my own work. I further declare that all the sources that have been consulted and quoted in this thesis have been duly acknowledged.

SURNAME AND INITIALS: MADUE SM

SIGNATURE: ..... DATE: .....

DEDICATION

This thesis is dedicated to my lovely wife Suzy and, our little treasures Madueotsile and Kelebogile for having sacrificed quality family time in exchange of my long hours of absence from home. We are in this together. You have contributed immensely towards the realisation of my dream to complete this thesis.

KEY WORDS

1. Department of Education
2. Economics of higher education
3. Higher Education Funding Frameworks
4. Higher Education Funding Formulas
5. Higher Education Institutions
6. Knowledge production
7. New Funding Framework
8. Public policy
9. Policy analysis
10. Policy gap
11. Policy implementation
12. Policy outcomes
13. Public Administration
14. Research output
15. Research output trends

LIST OF KEY ABBREVIATIONS AND ACRONYMS

ASSAf	Academy of Science of South Africa
CHE	Council for Higher Education
CI	Citation index
DoE	Department of Education (The current name of this department is "Department of Higher Education and Training")
GDP	Gross Domestic Product
HEIs	Higher Education Institutions
HEMIS	Higher Education Information Management System
HESA	Higher Education South Africa
IBSS	International Bibliography of Social Sciences
ISBN	International Standard Book Number
ISI	Institute for Scientific Information
MIS	Management Information System
NFF	New Funding Framework
NRF	National Research Foundation
R&D	Research and Development
RIS	Research Information System
SAPSE	South African Post-Secondary Education
SSCI	Social Sciences Citation Index
UNISA	University of South Africa

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LIST OF SOUTH AFRICAN HIGHER EDUCATION FUNDING FORMULAS/ POLICIES

1. The Report of the Holloway Commission (1951)
2. The Report of the Van Wyk de Vries Commission (1974)
3. The South African Post-Secondary Education (Universities only) (1982)
4. The South African Post-Secondary Education (Technikons) (1987)
5. The Refined SAPSE Subsidy Formula (1988)
6. Information Survey Manual – Report 014/97: introduced in 1997 for Universities
7. Information Survey Manual – Report 024/97: introduced in 1997 for Technikons
8. The Policy for the Measurement of research output of Public Higher Education Institutions in South Africa: introduced in 2001(New Funding Framework)

DEFINITIONS OF KEY TERMINOLOGY

1. Impact: The effect or influence of a policy, programme or service.
2. Inputs: The inputs are the resources used to carry out the work. Basically, inputs refer to resources or capabilities such as human resources, financial resources, infrastructure and contents.
3. Knowledge Economy: An economy in which applied information is used in all sectors to improve productivity and seek competitive advantage through innovation.
4. Knowledge Production: The act of acquiring new knowledge, as well as the act of communicating existing knowledge to new minds. In this study, research output emerges as proxy to measure knowledge productivity.
5. Outcomes: The extent to which inputs have impacted on the situation, institution or participants. Impact could thus be reported through experience, change in behaviour, attitude, conditions, skills or knowledge. In other words, outcomes refer to intangible results.
6. Outputs: An output refers to a piece of work produced by a project or study. In other words, outputs are tangible products in terms of quantity or volumes. Outputs are more measurable in nature.
7. Policy Analysis: The systematic analysis of the dimensions and variables that influence public policy. Policy analysis is also understood as the study of what governments do, why and with what effects.
8. Research: According to the Oxford Dictionary, the term “research” means an “act of searching closely and carefully”, or “intensive searching”. For purposes of this study, research in higher education is understood to be comprising of creative work undertaken on a systematic basis in order to increase the stock of knowledge, and the use of this stock to devise new applications.
9. Research Funding: In this thesis, the term “research funding” refers to government funding received by public Higher Education Institutions to conduct research.

10. Research Output: The knowledge outputs that result from academic or scientific research which typically include new theories, models, empirical findings and data.
11. Research Output Measures: In higher education, the primary measures of research output include academic or professional journal publications, books, published conference proceedings, patents, artefacts, and postgraduate students.

Chapter 1

Drawing the house plan – research methodology

No subject is inherently uninteresting. It is the way subjects are researched and reported that makes them desirable or undesirable, interesting or uninteresting – McNabb 2002

1.1 Introduction

The focus of this introductory chapter is to lay the foundation for the study through contextualising the research, providing the rationale and background for the study, and to present the motivation for embarking on this journey. The problem statement, the purpose, aim, objectives and research questions, all form the basis for the construction of this thesis. Although the first chapter mainly outlines the founding quest to conduct the study and provides an outlook of the research methodology, it also introduces a broad theoretical framework which leads the study towards its conceptual framework. The chapter is concluded by an overview of the main topics to be discussed in the remaining chapters of the thesis. The starting point is, therefore, conceiving the house plan through mapping out the research context.

1.2 Scholarly context

Government reform, *inter alia,* refers to changes in the structures and procedures of institutions so as to make them effective in achieving their purposes and more efficient in doing so in less time and with less expense. In the last decades of the 20st century, public administrators led largely through legislation and the allocation of resources. Accounting for such resources could not be reliably measured both qualitatively and quantitatively. Jones, Schedler and Mussari (2004:372) state that

administrators did not have to provide any clearly defined services but had to fulfil their tasks in compliance with the law and a detailed input budget.

Mader and Schedler (1994:35) postulate that it was accounting which furnished senior staff with the necessary, albeit rudimentary "controlling" information until the early 1990s. New Public Management[1] – which in Switzerland and Austria is known as Results-Oriented Public Management (*Wirkungsorientierte Verwaltungsfuhrung, WoV*) and in Germany as the New Guiding Model (*Neues Steurungsmodell*, NSM) – redirected the focus of administration management on effects and performance. This suggests that in scientific contexts of Public Administration scholars started thinking about performance orientation. As Lynn (2005:43-44) notes, in 1991 Christopher Hood was to coin a term that became a banner for the globalization of public management: New Public Management. In line with the New Public Management, government reform is a continuous activity worldwide. Government reform can be subdivided into legislative, judicial and administrative reforms.

At administrative level, reforms applicable to this thesis include:

a) More performance measurement and evaluation of government programmes.

   The new higher education funding framework which is the focus of this thesis is performance driven as it is concerned with the throughput rate of students (especially at masters' and doctoral level) and the research output of academics and researchers;

[1] The term "New Public Management" was meant to characterize a neo-Tylorite, neo-cameralist approach to managerial reform, originating with the Thatcher regime in Great Britain and with managerialist reforms in New Zealand and Australia (Lynn, 2005:44).

b) Increased use of professionals and researchers.

In the field of Public Administration, Wessels (1999) produced a chapter on how published research is utilised to enhance governance in South Africa;

c) Better coordination of government agencies (including higher education institutions and research councils) across different levels of government;

d) The development of the field of administrative law for clarifying due process in administrative adjudication, policy making, and judicial review.

Knowledge of and understanding the criteria for allocating block grants and research funding as well as reporting thereof (accounting for public funds), is of paramount importance in the fields of policy and public finance; and

e) More access to information (transparency) so that the public can obtain access to administrative records.

1.3 In the real South African context

In South Africa, the period between 1994 and 1999 has been characterised by wide-ranging and fundamental policy reforms. A number of policies were enacted with the aim of transforming the public sector. In education for example, it was within the rapidly changing global context, according to the National Commission on Higher Education (1996:1), that six months after South Africa's watershed first democratic election, Nelson Mandela issued a proclamation appointing a National Commission on Higher Education

(NCHE)[2]. The task of the commission was to "preserve what is valuable and to address what is defective and requires transformation". In terms of higher education funding, the *1997 White Paper 3 (WP3*) entitled *A Programme for the Transformation of Higher Education,* cited imminence of the new public higher education funding formula. The WP3 has articulated among others the following goals for a transformed higher education system:

a) To become an effective and efficient system that promotes high quality academic and educational standards;
b) To promote equity and redress in order to bring about equal opportunity for individuals and institutions;
c) To respond to the nation's social, economic, and political development needs; and
d) To ensure democracy and accountability in the governance and management of education institutions.

According to SAUVCA[3] (2002:2), there are immense opportunities to pursue the key goals of public higher education in South Africa, including economic development, high-level contributions to the knowledge economy, and the advancement of critical enquiry that is essential to a healthy democracy. In 2001 the Ministry of Education introduced the new funding framework. This was necessary as the old funding framework introduced in 1982-1983 was considered not be suitable any more. Apart from its origin in the apartheid past, it could not be used as a steering mechanism to address national goals and objectives (Madue, 2006:14). The higher education system needs to be steered to meet national goals and priorities through a combination of instruments, namely; planning, funding and quality assurance.

[2] The NCHE's major roles were twofold, i.e. to address the imbalances in higher education as created by the apartheid system and to transform higher education in line with the global trends by infusing it with international experience and best practice.
[3] SAUVCA is the acronym for the South African Universities Vice-Chancellors Association.

The new funding framework was to overcome the South African Post Secondary Education (SAPSE) formula introduced in the 1980s for universities, as Steyn (2002:253) points out. It also had to introduce a single funding formula for universities and technikons with more emphasis on increased equity in access and outcomes, improved quality and efficiency that links higher education activities and national and regional needs.

The higher education sector in any country plays a crucial role both in the advancement of knowledge, through research, and in the training of people for productive roles in society, through its teaching function. In virtually all modern societies, the public bears a considerable share of the direct costs of higher education. Barr (2004:264) adds that a mass, high-quality university system is expensive and competes with other imperatives. In South Africa, the *Higher Education Act, 1997 (Act No.101 of 1997)* provides for the regulation, establishment and functioning of a single coordinated higher education system. The Act further states that it is desirable for higher education institutions to enjoy autonomy and academic freedom in their relationship with the state, with some considerations of public accountability and the advancement of national needs for skills and scientific knowledge.

Higher education institutions (HEIs) are collectively an important component of human capital formation. They are also a major expenditure component for the tax-payers. Moreover, policy makers and higher education managers are increasingly under pressure to make sure that the tax-payers' money is well spent and produces useful and relevant graduates and research output that represent good value for money. With regard to research funding, Benneh (2003:254) posits that unlike developed countries where sources of research funding are diversified, African governments until recently constituted the main source of funding research. South Africa is no exception.

Madue (2009:531) writes that in South Africa, basic research and thematic research is funded by the Department of Science and Technology via the National Research Foundation (NRF) and by the Department of Education[4] by means of formula-based research funding to HEIs. In the competitive world where researchers in HEIs are in the contest of accessing research funds, the relationship between funding and research output attracts much interest and becomes a complex phenomenon (*ibid.*). The efficiency by which inputs produce desired output is thus an important public policy issue. Moreover, with increased competition for students globally, the efficiency of HEIs in the production of research output is an international rankings concern.

Research on higher education (Stumpf, 2001; Steyn and De Villiers, 2006; Zegeye and Vambe, 2006) indicates that central to development and innovation is the role that is played by HEIs. The history of public HEIs learning points to a mission that is threefold: that is, transmission of knowledge (teaching), knowledge creation (research) and community service. A number of writers refer to these three roles of higher education as the honoured trinity (Duderstadt, 1997, 1999; Hobson, Jones and Deane, 2005; McManus, 2007). These three institutional activities are interdependent.

However, most recently, public HEIs have been associated with not only teaching and research but with an added impetus to pro-actively act as engines for social and economic development that produce highly competent professionals, and leverage industrial developments through new technology development and their industrial linkages. Madue (2009:532)

[4] The current name of this department is "Department of Higher Education and Training". Due to the fact that this thesis deals with the subsidy formula between 2001 and 2006, the name as it was is used.

adds that scientific knowledge in South Africa is considered to be of paramount importance in positioning the country to be self-sustainable and rendering it more competitive as an important economic and developmental player not only in Southern Africa but in the global village at large. It is in this context that the study is aimed at exploring the effects that the national funding framework might have on the three dimensions characterising public HEIs, with a special emphasis on knowledge production.

The funding of HEIs in South Africa by the state has seen as a declining trend since 1987. Indicators such as the state funding of higher education as a percentage of the Gross Domestic Product (GDP) and the state of higher education funding as a percentage of total expenditure are used to confirm the decline. In their analysis of expenditure of the state on higher education, De Villiers and Steyn (2007:140) cited a decreasing trend from 0.86% of the GDP in 1987 to 0.66% in 2006, although a marginal increase was stated as a 10% in 2001/2. Figure 1.1. further indicates the declining trend in state funding of high education as a percentage of total expenditure.

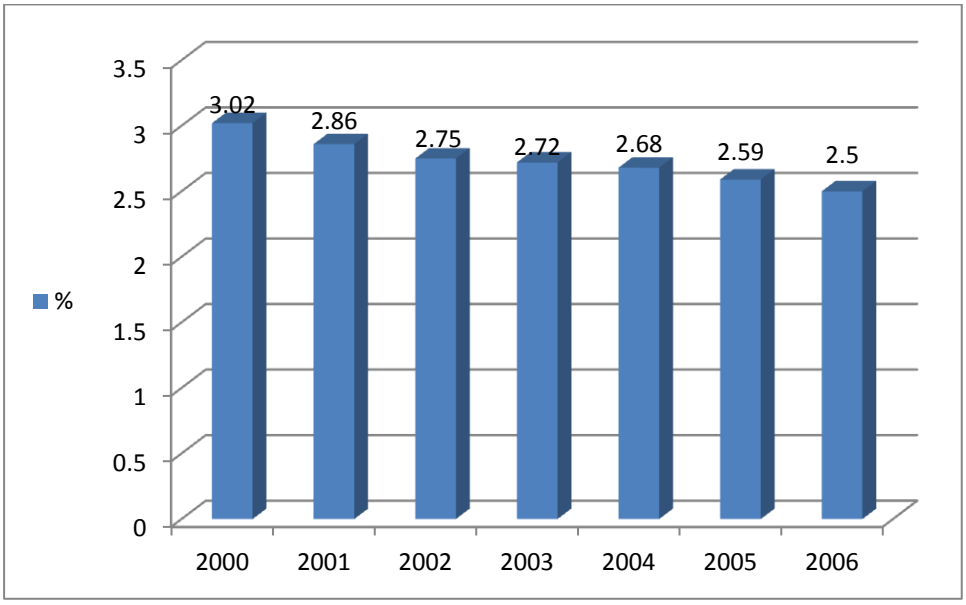


Figure 1.1. State funding of higher education as a percentage of total expenditure, 2000-2006

Source: Figure generated from data available on the DoE database

In monetary terms, the general funding of the system of innovation[5] and research as a percentage of GDP equalled 0.8% (1994); 0.7% (2001) 0.81% (2004) while OECD averages were 2.15% (Steyn, 2002:254).

Although the data abounds, Pouris (2007:15) argues that it is difficult to produce reliable research and development (R&D) statistics for higher education because the resources of higher education are used in a combination of teaching and research, and these activities are not easily distinguishable. Moreover, research is considered by some academics as part of the normal academic workload.

According to Muller (2005:88), although the debate about the relative importance of teaching and research continues, it is probably still accurate to state that academic reputations are still built on a research track record, rather than exceptional teaching skills. HEIs are extremely complex organisations that seek to achieve a multiplicity of goals. As Moed, Glänzel and Schmoch (2004:36) point out, it is often quite problematic to understand and "unravel" the structure of a research organisation in terms of "real" units such as departments or research groups. In addition, universities are multi-output entities producing research, teaching and community services (Cohn and Copper, 2004; Goldin and Katz, 2001; Ward, 2002). Pouris (2007:4) adds that another difficulty in measurement arises from the different definitions given to science, research and innovation. He further states that the *Frascati* Manual defines "Research and experimental development (R&D)" as comprising "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications".

[5] The system of innovation includes HEIs and research institutions such as the Human Sciences Research Council (HSRC),the Council for Scientific and Industrial Research (CSIR) and the Medical Research Council (MRC).

However, the problem of definition is particularly pressing in the social sciences and humanities, where it is difficult to classify activities in *Frascati* terms. Furthermore, such difficulties are exacerbated in countries where a substantial research culture is lacking, and where academics have a tendency to overestimate the time they devote to research in order to satisfy their managers.

Building on the above rationale and background for the study, a research problem, also referred to as a problem statement needs to be presented. Although the problem statement is presented from the South African context, it can be applied in other countries, more especially in the developing countries.

1.4 Problem statement

The first activity in researching the scientific way is the recognition of a problem (McNabb, 2002:6). According to Bless and Higson-Smith (1995:3), the scientific method of acquiring knowledge, also called scientific research, is a systematic investigation of a question, a phenomenon, or a problem using certain principles. The Scientific method is according to Dodig-Crnkovic (2001:7), the logical scheme used by scientists searching for answers to the questions posed within science, as well as to formulate theories and to assure the means for producing them (instruments, tools, algorithms). A science can be defined as a building of knowledge obtained by use of a particular methodology, the scientific one. The first step to knowing is the description of the object, of the relationship or the situation.

In the Positivist tradition, the practice of science is presented as something that bears no relation to the person or the scientist. This is not a true depiction of the scientific endeavour. The problem statement and research

questions of this thesis were formulated by an individual in a real life situation. Therefore, the first person (I) is used throughout this study. This is not unscientific as was explicated by Wessels and Pauw (2006). The object of the study must be accurately depicted. Here, evidently, the empirical method of objective observation must be used. Then, an explanation, a statement of the relationship between the described facts should be expressed – if possible in the form of a law (Bless and Higson-Smith, 1995:3). Science is not an add-on. Moreover, Bless and Higson-Smith further argue that all different sciences are united not by their different subject matter but by their common method by the way knowledge is acquired.

The research problem for this study is concerned with the new funding framework for public higher education in South Africa. However, before explicating the problem further, the reader must take note of the following information as set out by Smith. According to Smith (1999:172), the only prospect for short- and medium-term future is that the share of university costs paid by the public purse will continue to decline. The implication of Smith's argument is that, the pressure on public expenditure to address pressing needs such as health, housing and poverty alleviation will continue to dominate the pressure exerted by the need to increase higher education funding. The new funding framework for public higher education advocates one set of funding policies and mechanisms for the higher education system[6]. The funding is complex and multi-dimensional. The funding allocation is based on three windows, namely (Ministry of Education, 2003):

[6] For universities and technikons. Since the implementation of the transformation of higher education institutions in South Africa after 1997, technikons were renamed to Universities of Technology.

a) Block Grant Funding

The block grant funding refers to institutional set-up subsidy costs (basic running costs irrespective of size or number of students). The subsidy is paid to institutions on the basis of their planned full time equivalent (FTEs) in different fields of study.

b) Earmarked Funding

These funds are allocated to achieve specific institutional purposes. Under this category, funding is earmarked for a national student financial aid scheme; institutional development and redress; interest and redemption payments; approved capital projects; research development and other developmental projects.

c) Research and development

The funding for this category is of paramount importance from my point of view. The then subsidies made to institutions of higher learning for blind research funding has fallen off as the current funding framework is output driven. The research and development funding component comprises of research scholarships for outputs at Masters and PhD levels; facilitating research collaboration at regional and national levels; and publication output computed (measured) at 0.75 unit allocation.

Yet, the assessment of higher education institutions' performance on knowledge production, especially the research output as a portion of accounting for public funds is not a simple matter. Cohn and Cooper (2004:596) explain that, the measurement of the research output is perhaps

even more perplexing. The following reasons are cited as problem areas in the measurement of research output:

Firstly, in the words of O'Brien (1994), academic knowledge is not a homogeneous form of output that can be easily compared, even within disciplines. There are fundamental differences between the nature of knowledge and the way it is produced by departments of science on one side and departments of social studies and humanities on the other (O'Brien, 1994:16). Yet, one would measure various components of research output, such as journal articles, books for specialists and published conference proceedings. Such output measures can be difficult enough to produce for a single academic department of a faculty.

Secondly, the measurement of research output is the subject of policy debate, since funding is particularly received according to the number of publications produced and published in predetermined ("accredited") journals. In terms of the *Policy and Procedures for the Measurement of Research Output for Higher Education Institutions in South Africa, 2003*, each higher education institution submits to the Department of Education, audited claims for journal outputs, as well as books and conference proceedings together with supporting documents.

Thirdly, senior researchers experience many demands on their expertise, such as reviewing journal articles, assessing research grants applications, sitting on selection and promotion committees and being co-opted to national or institutional review bodies, hence the "blind review" component. All these important research related activities are not considered measurable outputs.

Fourthly, there is a strong case to be made for what counts as high quality research output in the South African context. Quality research helps to build

and brand the country's research, attract foreign interest, contribute in government transformation, and identify what research is done and what it means in this part of the world. It is against this background that I set out to critically explore the effects that the research subsidy component of the new funding framework has on the knowledge production of South African Higher HEIs.

The purpose of this study is to trace and explain[7] the differential impact of South Africa's new funding framework for higher education on knowledge production of the public universities. The study will present the trend analysis of both the pre- and post-implementation of the new funding framework. The question then is, how do public higher education institutions respond to the new South African funding framework? In other words, what effect does the research subsidy component of the new funding framework have on HEIs' knowledge production?

Research informs us that the production of knowledge is a social process, a social construction, whereby the world of policy-making and the world of research and science meet each other and work together in producing policy-relevant information, which is the sort of knowledge produced especially to serve as input to the policy process (Van Buuren and Edelenbos, 2004:292). This research, therefore, also seeks to contribute to the scholarship of knowledge production and policy-making. Having presented the research problem, it is imperative to outline the research questions that will be addressed in this study.

[7] One of the reasons for undertaking scientific studies is to explain causal relationships. These studies attempt to provide answers to the "why" and "how" questions. The purpose of these studies could be to generate hypotheses, as well as test and validate theories (Babbie, 2001; Mouton, 2001).

1.5 Research questions

The principal research question of this study is:

> What were the effects of the research component of the new subsidy formula on higher education knowledge production between 2001 and 2006?

The research question is further outlined by means of the following sub-questions:

a) How can knowledge production be measured and represented? (See Section 3.2. “About knowledge production”, below).
b) In what ways does the new government policy on higher education funding influence the behaviour of researchers and managers in public higher education institutions?
c) Is the new policy on higher education funding more effective than the previous policies? In other words, does the new policy improve or retard knowledge production when compared with previous policies?
d) Can we see a new trend after 2001 in higher education research output? If there is a new trend, how do we explain that?

1.6. Theory and research hypothesis

Comparison can be a source of explanation, of accounting for why things happen in one country and not in others, or why they happen in different ways. Used like this, to distinguish some causal variables from others, it is the closest the policy sciences come to experimental logic (Freeman, 2006:384). The new funding framework for public HEIs in South Africa introduced in 2001 affects institutions in various and unique ways. It also has

an influence on the research output patterns of HEIs which might be problematic or advantageous.

A number of theories can be considered in guiding researchers to fully investigate patterns of higher education knowledge productivity and the factors that influence the productivity levels. On the one hand, a system of funding HEIs by means of subsidy formulas can, for example, be viewed from the behavioural reinforcement theory perspective (See Skinner, 1969; Blackburn, Bierber, Lawrence and Trautvetter, 1993; Blackburn and Lawrence, 1995). The rewarding of HEIs for their knowledge production output and the rewarding of individual researchers in the form of promotion

or monetary incentives can thus be viewed as the greatest motivating effect. This thesis argues that as a reinforcement schedule, the introduction of the new higher education funding framework, and especially the research subsidy component, influences the knowledge productivity curve.

On the other hand, the expectancy theory elaborates on a rationale for how individual needs, values, and perceptions about the situation and/or environment determine one's behaviour. Tien and Blackburn (1996:6) write that on the basis of the expectancy theory, an academic's motivation to conduct research will be greatest when he or she; (a) believes research performance will lead to an outcome; (b) perceives the outcome to have a value; and (c) believes that with effort one will be able to perform at the desired level.

In this study, I have employed the behavioural reinforcement theory to analyse the effects that the research subsidy component of the new funding framework has had on the knowledge productivity of South African public

HEIs. The behavioural reinforcement theory is in this regard, employed in close relationship with the hypothesis of this study.

The main hypothesis for this study is that:

> The research subsidy component of the new funding framework has had a positive influence on the knowledge production of HEIs in South Africa. That is, we can see a new trend of a sharp increase in HEIs knowledge production since the introduction of the new funding framework.

Wallace (1971), as quoted by Andrews (2007:161) writes that science has proven to be a wonderfully productive enterprise, generating useful knowledge faster and cheaper than any other social activity the world has ever known. Given adequate resources, the wheel of science spins happily along, cycling from induction to deduction, from gathering evidence, to detecting patterns in the evidence, to formulating conceptual explanations for those patterns, to testing these hypotheses against additional empirical evidence. This suggests that this study will also follow the scientific pattern of providing empirical evidence to test its hypothesis. With the testing of the hypothesis, this study will either confirm or reject its hypothesis. The starting point in this regard is to identify the unit of analysis and to provide the unit of observation.

1.7. Unit of analysis and units of observation

It can be deduced from the main hypothesis that the unit of analysis for this study is the research subsidy component of the new funding framework for higher education subsidy policy while the units of observation are research

outputs as representing knowledge production and the behaviour of universities.

1.8. Research objectives

The objectives of the proposed research are to investigate the extent to which the research subsidy component of the new funding framework has influenced knowledge productivity levels of HEIs between 2001 and 2006; identify key challenges facing the universities in implementing the new subsidy policy; and to recommend proposals on how best can the policy be implemented and/or complied with, with the view of increasing or improving the institutions' knowledge production in line with the New Public Management (NPM). This study has the following three sub-objectives:

Sub-objective 1: To determine the actual output trends, especially for the period 1994 – 2006.

Method: Obtain data from Pouris (2006), De Villiers and Steyn (2007) and the Department of Education (2008).

Sub-objective 2: Plot the expected trend

Method: Making statistical assumptions to determine other factors impacting on the trends. At this stage, the hypothesis shall be confirmed or rejected.

Sub-objective 2 (a): Interpret the trends, measure the difference from what was to be expected if the new subsidy formula was not implemented.

Method: Numerical comparison of the research output for the period before and after the introduction of the new subsidy formula.

Sub-objective 3: Explain the trend after 2001 (the new funding framework).

Method: Explain the trend by deducing the probable causes of the trend and by identifying a number of concomitant variables that might exhibit the same trend. Variables such as the number of new journals that might have been introduced during the period under study, increased human resource capacity, the direct payments to researchers for published outputs as an incentive and, the general increase in world output trends will be deduced.

Sub-objective 3(a): Determine how higher education institutions respond to the new subsidy formula.

Methods: Qualitative and quantitative analysis including a detailed analysis of the mechanics of the formula.

1.9. Motivation and significance of this study

There are no limits to what may be researched or how researchers go about conducting their research activities nor are researchers limited to one or even a few different approaches to their scientific investigations (McNabb, 2002:276). Researchers are motivated by various things including among others their experience, interests, observations and the nature of their work. My motivation to engage in this study derives partly from my masters' studies titled "*The measurement of research output of public higher education institutions in South Africa: hurdle or handle*?" (Madue, 2006). The focus of the study was on one institution, namely the University of Pretoria and its four faculties; and to identify challenges that a single public higher

education institution is facing in implementing the current funding framework.

The experience gained when conducting research on how the University of Pretoria responds to the government's research output policies, together with the results that emanated from the study, prompted my interest to broaden the study by exploring the effects that the research component of the new funding framework for public higher education in South Africa might have had on all HEIs from 2001 to 2006. Identifying and explaining the effects that the research subsidy component of the new funding framework has on HEIs knowledge production can play an important role in informing policy makers on the whether the policy is yielding its intended goals or not, and in improving higher education knowledge production in South Africa.

Brynard (2009:558) writes that the desired outcome of policy implementation is success. He continues to state that successful policy implementation is a strategic action adopted by government to deliver the intended policy decision and to achieve the intended outcomes. Success in terms of policy implementation implies achieving the expected functionality required by an identified stakeholder (*ibid.*). Therefore, another motivation for this study is to contribute to the policy implementation discourse by informing the policy makers of the extent to which the new policy has achieved its intended outcomes.

Moreover, an indication of trends in knowledge production rates since the implementation of the new subsidy policy in 2001, is potentially of importance to the providers of higher education funding, i.e. government, the clients of HEIs (students and researchers), and managers of HEIs (Deans, Vice-Chancellors and Research Managers). Pouris (2006(a):23) emphasizes that governments and university management are both interested in evaluating of the performance of tertiary education: the former to protect the public and make intelligent choices in the allocation of scarce

resources, and the latter, in order to manage properly. From the international perspective, Kulakowski and Chronister (2006:152) posit that increasingly scarce resources have dictated that even well-endowed institutions must carefully review funds allocated for new academic initiatives, including those for research and scholarship. This environment has led to scrutiny of existing support and increased concern that investments are being made strategically.

It is envisaged that my thesis would be valuable to the research community and national governments since through providing knowledge production trend analyses of HEIs, the stakeholders may use the findings to:

a) stimulate policy development and implementation discourse brought about by highlighting the effects of implementing research output policies by the South African HEIs ;
b) assist the resource allocation/budgeting process by supporting a means of allocating research funding based on the available data on research output and, agreed plans for improved performance, rather than on the assumption that performance should equal past levels; and
c) assist public managers in tracing policy implementation successes or failures as well as determining factors thereof.

Factors determining policy implementation successes are discussed in detail in Chapter 5 of this study. Identifying major constraints (policy gaps) in the implementation of the new funding framework, particularly the effects that the research component might have on higher education knowledge production, can provide the impetus for institutions to fundamentally rethink how they do things. Accounting for public funds allocated and granted to HEIs is a public policy issue. Ingram and Schneider (2006:182) stress that accountability is critical to democratic governance, and is quite different from political support.

Higher education funding based on the aggregate research output of universities, is driven by specific policy goals such as to stimulate and reward institutional research. Whereas traditional administration has focused primarily on the financing of tasks, the question of efficient and effective performance on knowledge production has assumed a more important role today.

Indicators such as research output and student throughput are widely used in education, and science and technology policy (Le Grange, 2003; Madue, 2006; 2007; 2009; Moed, 2000; 2005; Moxham and Anderson, 1992; Mubangizi, 2005). In a number of ways, and in a number of countries, these indicators have set the technological, economic, and political agendas. However, different ways of measuring higher education research and development (HERD) can produce different policy outcomes (Pouris, 2007:1). In South Africa for example, the South African Agency for Science and Technology (SAASTA) builds the potential pool of human resources for R&D through three thrusts: science education, science awareness and science communication (research output). (Also see Madue, 2009) .

Higher education institutions are dependent on the government subsidy for research output among others as a means of generating research and running expenses. In South Africa for example, in the words of Pouris (2004:515) it was estimated that academic institutions will receive more than R70 000 for each qualifying article published during 2004. As a policy issue, research output is continuously assessed, and funding is made contingent on the quality of the research performed. The transformation agenda in South Africa sought to create a single co-ordinated higher education system through the *Higher Education Act, 1997 (Act No.101 of 1997)*. In *Education White Paper 3: A programme for the Transformation of the Higher Education System (June 1997),* it was indicated that the transformation agenda required the development of a new funding framework as discussed in Section 1.2. ("Scholarly context") above.

Several countries are linking funding of higher education to expected outcomes. Management principles of economy, efficiency, and effectiveness are becoming measures of good governance in higher education. Managing by outcomes or outputs rather than inputs has led to some performance-based and/ or incentive funding models rewarding actual rather than promised performance levels. The new funding framework (NFF) is said to be a goal-oriented and performance-related distributive mechanism that explicitly links the allocation of funds to academic activity and output; in particular the delivery of teaching-related and research-related services, which contribute to the social and economic development of the country. Pillay (2003:2) sums it up by stating that:

> *The new model represented a major change in focus. It emphasises that the primary purpose of higher education is to teach, research and play a pivotal role in the improvement of the social and economic conditions of the country.*

The question is: how will this study add to the knowledge base or to the scholarship of public policy and higher education?

Research has a special role in a practitioner-oriented field such as public administration and management by serving not only to guide needed theory development but also to influence the practices and even the decisions of managers and policymakers (Kroukamp, 2009:90). This study seeks to contribute to the global knowledge base of policy development and management, research funding of public HEIs, and public accountability by identifying and highlighting the trends in the South African HEIs' implementation and use of the NFF and the policy for the measurement of research output of public HEIs. The study also brings in the international trends of knowledge production of HEIs, faculties, academic departments and individual researchers. This is seen in the emphasis of publishing knowledge output in the DoE accredited journals as well as journals

accredited by international organisations such as the International Scientific Index (ISI).

As an academic field, public administration and management is obligated to advance theoretical and pragmatic understanding of governmental institutions and processes. Such understanding, however, cannot be advanced solely by the explication of current knowledge through education and service; it also requires the generation of new knowledge through research (Liebman, 1963:168 as cited by Kroukamp, 2009:90). This study relates directly to the transformation of the higher education system and the restructuring of higher education funding in South Africa, as well as how institutions are accounting for the public funds. In South Africa, higher education funding is greatly influenced by knowledge production output, in other words, research output. A study on the effects that the research output subsidy component of the NFF has had on HEIs knowledge production in South Africa is valuable not only from the researcher's point of view, but might also be of interest to public officials and policymakers who are concerned with expanding higher education while containing costs, other officials at South African HEIs who wish to address the factors that influence knowledge production to stimulate increases in their output.

The findings and recommendations of this research thesis would be shared with my academic peers, researchers and government officials who are interested in policy implementation (particularly successes or failures of the NFF) and in research output trends. This will be done among others, through presenting the findings at professional conferences and publishing in accredited academic journals, in accordance with the prescripts on the NFF. Having outlined the significance of the study and indicated how the research findings will be communicated, it is now imperative to present a bird's eye view of the focus of this thesis.

1.10. The focus of the study

In society, institutions of higher learning are for example regarded as a major role player in the global economy, the enhancement of knowledge society and the development of communities. The three core functions of such an institution, namely the generation of new knowledge (research), the transmission of new knowledge (teaching) and the application of knowledge (community services) are therefore directed at meeting these challenges (Kroukamp, 2009:88). The focus of this study is on analysing the research output trends of South African public HEIs in both pre- and post-implementation of the NFF. A special emphasis is placed on the implementation years of 2001 to 2006. The Higher Education Management System (HEMIS) of the DoE is the main database from which this thesis derives its input.

In South Africa, higher education funding through the measurement of research output of institutions of higher education, is driven by specific goals such as to stimulate research at the highest level and to encourage the development of centres of research excellence in the universities. Townley, Cooper, and Oakes (2003), as cited by Frolich (2006:74) add that, the call for increased public accountability comprises one major reason why academic inquiry is increasingly conceptualised in terms of research output. Therefore, it can be deduced that the research output should present a worthy profile of high-level research at South African universities in terms of both quality and quantity.

1.11. Research strategy

This is a mixed methods[8] study of the effects of the research component of the NFF on the knowledge production of HEIs in South Africa. Among other methods, the study has employed content analysis of the former higher education funding policies and the current policy to trace the similarities and differences in approach and implementation, and documented the trends of higher education research output pre- and post- the NFF to determine whether the current policy has resulted in the expected increase in higher education knowledge production, that is, the intended policy outcome.

Four types of research strategies are used in public administration research: qualitative, quantitative, participatory action and combined[9] (McNabb, 2002:25). A combination of a qualitative approach (integrating expert-opinion) and the quantitative methods is required if one wants to systematically explore the effect and impact of policy implementation in areas like education, public administration and strategic research, because it is long-term and cannot easily be attributed to certain measures or programme activities (Johnson, Onwuegbuzie and Turner, 2007:112). In the footsteps of Johnson *et al*., (2007), this study is positioned between the extremes of quantitative research and qualitative research, with mixed research[10] attempting to fully respect the wisdom of both these viewpoints while also seeking a workable middle solution for many (research) problems of interest.

Although this study employs a mixture of research methods, the crucial method in this study is the quantitative method. Winter (2000:6) writes that a quantitative researcher attempts to fragment and delimit phenomena into

[8] Methods are the means researchers use to link their inquiry system to the universe they want to create knowledge about. The methods permit them to get information about the universe they are investigating and to make it reveal its secrets (Stymne, B. 2006).
[9] Combined strategies are using components of both qualitative and quantitative methods to enable a balanced inquiry.
[10] Mixed research, in its recent history in the social and behavioural sciences, started with researchers and methodologists who believed qualitative and quantitative viewpoints and methods were useful as they addressed their research questions (Johnson *et al*., 2007:113).

measurable or common categories that can be applied to all of the subjects or wider and similar situations. The techniques that I have used included, among others, exploring existing statistics, document analysis, database utilisation and analysis, as well as critical incident analysis as discussed in Chapter 4 and Chapter 5. The following table provides a summary of a research strategy that I have used in this study:

Table 1.1. Summary of the research strategy

Research Question	Method/ Instrument	Purpose
1. What effects has the research component of the new funding framework had on HEIs knowledge production?	Extracting data from the DoE's Higher Education Management Information System (HEMIS) database. Interpretation of content.	To determine ways in which the new policy impacts on public higher education institutions.
2. Is the new funding policy more effective than the previous policies from the perspective of institutional stakeholders? In other words, does the new policy improve or retard knowledge production when compared with previous policies?	Literature review. Content analysis of previous government policies, research information databases, and tracking differences in policies and data banks.	To assess the effectiveness of the new funding framework in comparison with its predecessors.
3. Can we see a new trend after 2001 in the research output of HEI? If there is a new trend, how do we explain it?	Reviewing and analysing statistical records documenting research output trends of pre and post implementation of the NFF. Trend analysis.	To determine the knowledge production patterns of both pre- and post -implementation of the NFF, and to examine factors that might explain the new trend if it is established.

In this thesis, a number of strategies have been used to collect information to address the research questions. The strategies included extracting data utilisation from the DoE's HEMIS databases, analysing various databases

(such as the Research Information Systems and Citation Indexes), observation[11] and review of statistical records.

The above data collection methods were informed by the analysis of the strengths and weaknesses of each method as illustrated in the below table adapted from Anderson (1998).

Table 1.2. Strengths and weaknesses of data collection methods

Strengths and Weaknesses of Data Collection Methods		
TYPE	**STRENGTH**	**WEAKNESS**
Questionnaire	Efficient Large number of respondents	Extensive planning Low response unless responses are followed up intensively
Interview	In-depth information High response	Extensive planning Time consuming Analysis difficult
Focus group	Group synergy Diverse perspectives	Extensive planning Analysis often difficult Logistics
Observation	Collects data on actual human behaviour and natural environment	Analysis difficult (potentially unreliable)
Existing statistics	The data is already existing in the form of previously collected surveys	Locating sources can be time consuming, so the researcher needs to carefully consider the meaning of what he/she finds

Source: Adapted from Anderson, (1998:168).

[11] In addition to being consumers of research, researchers are also collectors and producers of research evidence. One manufactures evidence every time: one seeks out others' opinions about some issue; attempts to estimate the prevailing opinion within a particular group; and draws conclusions about persons and events on the basis of own observations (Singleton and Straits, 2004). Stymne (2006:266) posits that the researcher is equipped with both ears and eyes. He continues to state that most of the time we listen with our eyes closed. The accounts that managers give us about that they do, show little resemblance to what we see them doing. It is therefore probable that a better balance listening and looking would render observations that led to more innovations in management research.

From Table 1.2. above, it can be deduced that the preferred data collection method for this study has been an analysis of existing statistics, since neither questionnaires were administered nor formal interviews were conducted. The primary method of data collection was data utilisation in the form of tracing research output trends, while the secondary method was the analysis of the meaning of documents. As such, the study was concluded by a critical analysis of the research output trends of HEIs in South Africa before and after the implementation of the NFF. In this study, an analysis of South African HEIs knowledge production trends is preceded by an overview of the global knowledge production, Africa's contribution to the global knowledge production, and South Africa's rating in comparison with India and Brazil.

1.12. Generating data and data analysis

Types of data analysis in this study have included but were not restricted to document analysis, content analysis, and trend analysis. As the starting point, document analysis included past and current DoE funding frameworks and policies on the measurement of research output. The major differences in past and current policies were identified and analysed. An application of systematic observation was employed in the content analysis of previous and current DoE policies.

The policy documents consulted have resulted in a high volume of raw data, which had to be processed, analysed and reduced to manageable proportions. The policies studied were labelled as primary documents. The data was then classified, a process that has involved breaking up data into bits and bringing it together in a new way. The classification and coding process constituted organising and assigning data into categories or classes and identifying formal connections between them. Managing the coding process took the form of cutting and pasting (from electronic references), colour coding, the use of word processing such as Microsoft

Excel, Microsoft Access and the use of Computer Assisted Qualitative Data Analysis Software (CAQDAS) such as Atlas.*ti*, identifying patterns and connections within and between categories. In case of larger categories, several categories with clear relationships were combined and their relationships were shown. Now that the data collection and analysis techniques for this study have been elaborated on, the next step is to explore the validity and reliability thereof.

1.13. Validity of the study

Scientifically produced knowledge contributes to substantive rationality. It provides the factual basis for better decisions. It satisfies scientific criteria of validity and reliability, and it justifies authoritative knowledge claims (Andrews, 2007:162). In order to underpin the reputation and reliability of the thesis, the study has used the latest data available on the HEIs Information Management Systems such as the Research Information System (RIS) of the University of Pretoria and the Higher Education Data Analyser (HEDA) of the University of South Africa, that are used to capture the annual research output, the Bureau for Institutional Research and Planning of the University of Pretoria and other related Centres of various institutions, as well as the Higher Education Management Information System (HEMIS) and the National DoE policies, annual reports and other relevant documents. Among other information management systems, the RIS system has proven to be effective in the coordination of the research output, not only for the purpose of the DoE subsidy, but also for the use of academics for various research projects.

Joppe (2000:1) explains that validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to hit “the bull’s eye” of your research object? Researchers generally determine validity by asking a series of questions, and will often look for

answers in the research of others. To enhance the validity of the data collected and used in this research project, as well as the findings thereof, the findings of this study were compared with those of other South African authors such as Pouris (2006(b)) and De Villiers and Steyn (2007). Furthermore, the use of peer review was employed to compare and contrast the findings of this thesis.

I have complemented the validity of the data with a strong theoretical base (also referred to as “the authority argument” because it uses the respected researchers in the field as evidence) and a coherent convincing argument based on both empirical evidence, and the researcher’s understanding and logic. The evidence comes from the data and from the theory that explicates and explains the data (Henning *et al*., 2004:7).

The study on how public HEIs respond to the NFF in line with the measurement of research output of South African HEIs, and the effects of the research subsidy component of the NFF on knowledge production must be credible to the outside world. The study has used statistics and led to the need for use of statistical validity and techniques. Reimers and McGinn (1997:73) postulate that the validity, or truth value, of research depends on the methods used. In qualifying this statement, Shuttleworth (2008:1) explains that validity encompasses the entire experimental concept and establishes whether the results obtained meet all the requirements of the scientific method. Neuman (2000:167) cautions that validity is more difficult to achieve than reliability. We cannot have absolute confidence about validity, but some measures are more valid than others. In order to accurately quantify the research output of HEIs and to make international comparisons, the study has relied on the use of bibliometrics.

Bibliometrics indicators are consistent in that they are clearly defined and unambiguous (Pouris, 2003:425). Information on the quantity of publications will be derived from the DoE’s HEMIS database and other databases such

as that of the ISI, with regard to South Africa's total number of publications listed there, and the country's share of the world's publications. A discussion on the validity and reliability paves the way for limitation of the study. Like other scientific studies, this study has some limitations as discussed below.

1.14. Limitations of the study

The NFF and the policy and procedures for the measurement of the research output of public HEIs in South Africa, cuts across all the universities in the country. The higher education system in South Africa is a highly complex system, more especially in its current transformation status where the majority of institutions were still undergoing the merging process during the period under study. Dumitru (2008:77) states that knowledge production has an intangible and a tangible nature. At tangible level we deal with objects that can be seen, touched and measured. At the intangible level we deal with things that cannot be seen, touched and measured directly, at least at the present moment. They can be evaluated indirectly, by their consequences. This reflects our limitation to measuring only tangibles. The major limitation of this study is that it measures tangibles in the form of published research output. In his concluding remarks, Dumitru (2008:78) argues that the analysis of the scientific production of a university is a difficult process and is done only at tangible level, at least for now.

The dominant method used in this study is the quantitative method. Quantitative methods do have their own shortfalls. The disadvantage of the qualitative research method is the difficulty in achieving measurement validity. The limitation of the study also concerns the data analysis methods used, one of them being the interpretation of content. Although the interpretation of content analysis is utilised in this study, it may lead to naively realistic findings. The interpretation of content captures what is presumed to be the real meaning of the "word" in a direct or formulaic way.

Henning *et al*., (2004:102) argue that the assumption is often made for you to arrive at a set of findings, due largely to the stringent application of the method of coding and categorising.

Although the NFF is output driven, the assessment of knowledge production requires measurements along many dimensions. To date no ideal "catch all" variable for measuring research output or innovation (that is, knowledge) has been developed. In many cases, multiple indicators such as journal articles, books and conference proceedings, have been used. There is a need for a single widely accepted method applicable to all aspects of the measurement of knowledge output. The use of isolated measures, such as published refereed journal articles can be misleading and can lead to an over-emphasis of one element of quality in research outputs, to the neglect of others. On the other hand, the peer review system has been severely criticised for its larger probability of subjectivity. But, the two systems are interrelated. One gets published after being refereed by peers.

It is also a limitation of the study that the unit of measurement of knowledge production is limited to certain outputs as circumscribed by a system of accreditation that will be explained later (See Section 1.7. "Unit of analysis and units of observation", Section 5.3. "Estimating research output" and Figure 5.3. "Types of research output"). This means that not all knowledge outputs will be counted, but only those recognised by the DoE for subsidy purposes. I share the assumption embedded in the funding framework that only the best knowledge outputs should be counted. Knowledge production is measured in this thesis by means of a proxy.

The other limitation is that, an important dimension of institutional quality that is left out in this research project is the successful completion of individual research programmes by postgraduate students. According to the NFF, the completion of research programmes by postgraduate students is considered to be corporate information and not research output or

knowledge production (Ministry of Education, 2003). Another limitation focuses on the definition of terminology associated with knowledge production. Waugaman, Kirby and Tornatzky (2006:143) write that lack of established definitions for such terms as “full-time equivalent”, “research faculty”, “proposal” etc., and general lack of consistency in reporting such data create difficulties in generating accurate comparative data. All these factors affect the quality of the results. Now that research has to be limited to allow future verification, I would like to pause at this point and outline the structure of the study as presented in the chapter layout.

1.15. Schematic presentation of the chapters

The thesis takes the form of investigating and analysing the effects that the research subsidy component of the NFF has on knowledge production of HEIs in South Africa. Chapter one has delineated the relevant research perimeter. It has served to lay the foundation for the thesis through outlining the research context and the formulation of the research problem. The research method and design also formed part of the foundation and has helped to reinforce the concrete slab for the house. The remainder of the building blocks of the thesis is presented hereafter.

Chapter 2: …and this is where it started – policy issues

Chapter 2 is designed to align the key concepts of the study. The aim of this chapter is to ideologically position the research project as well as to outline the contribution that the study is aimed to make in the research community. In other words, Chapter 2 is all about a presentation of the house plans. The emphasis of Chapter 2 is on identifying the gap between policy making and policy implementation, more especially in the South African context. The conceptual framework to be outlined in Chapter 2, serves to anchor the study on the literature review.

Chapter 3: What other authors had said before - literature review on knowledge production, the knowledge society and the economics of higher education

In Chapter 3, the foundation of this study is laid through standing on the shoulders of the authors who have written about the related topics. In other words, a literature review is conducted to establish what is already known about the subject and help to stage the research project or identify a niche area which the study will occupy.

Chapter 4: Putting up the structure - A comparative analysis of the two funding regimes

Putting up the house structure in Chapter 4, the previous funding policies (SAPSE formulas) which were used for almost twenty years to subsidise universities and technikons are analysed in comparison with the NFF which is said to be goal oriented. The advantages and disadvantages of both the NFF and its predecessors form the basis of Chapter 4. The chapter is concluded by a synopsis of the similarities of the two funding regimes. Chapter 4 is also aimed at providing a detailed background on which Chapter 5 is founded.

Chapter 5: Roofing – higher education research output trends

While the focus of this thesis is primarily on the South African higher education institutions' knowledge production, this Chapter provides an overview of the global research output trends. The African continents' contribution to the global knowledge production is also highlighted as a means of locating South Africa's standing among the developing countries. Chapter 5 is directed at answering the research questions: Can we see a new trend after 2001 in the research output of South African HEIs? If there is a new trend, how do we explain it? Therefore, the chapter outlines an analysis of the trends of South African HEIs knowledge production since the

introduction of the NFF in 2001. The chapter is concluded by an overview of the lessons learned from the output trends as a means of making a meaningful contribution to the research community.

Chapter 6: Making sense of the findings

Although the findings are recorded throughout the study, Chapter 6 is aimed at comprehensively discussing such findings and drawing up some recommendations. In other words, the chapter is aimed at appreciating the completed building and reflecting on some experiences gained in the process. The chapter is also be used to test the validity of the study. In this chapter, the two methods of testing validity (predictive validity and construct validity) were employed. Coombes (2001:176) explains that predictive validity is sometimes called criterion-related validity. The results of research are sometimes used to predict what will happen in the future and the predictive validity of the results is investigated by correlating the prediction made at the time with what actually happens later. She further states that comparing the results with what would be expected as a result of policy implementation or academic theory is known as construct validity. This chapter has in this regard tested whether the hypothesis was confirmed or rejected.

Chapter 7: Conclusion – settling the dust

The last chapter of this thesis, being Chapter 7, is aimed at comprehensively summarising the thesis. The chapter consists of a narration of my experience in this research journey. Rounding off the research methodology used in this thesis has, therefore, formed part of this concluding chapter. Lessons learned from conducting literature review are tailored as a possible basis for future research projects. A synopsis of the results of a comparison of the previous and new higher education funding policies is reiterated in Chapter 7, with the aim of fuelling a continuing

discourse on policy development and implementation. Lastly, lessons learned from Chapter 5 are highlighted as a quest to present approaches adopted by higher education institutions in responding to the NFF.

1.16. Conclusion

The purpose of Chapter 1 was to explicitly explain the rationale for undertaking this study. The study is aimed at exploring the influence that the national funding framework might have on one of the three dimensions (teaching, research and community service) characterising public higher education institutions, that is, research.

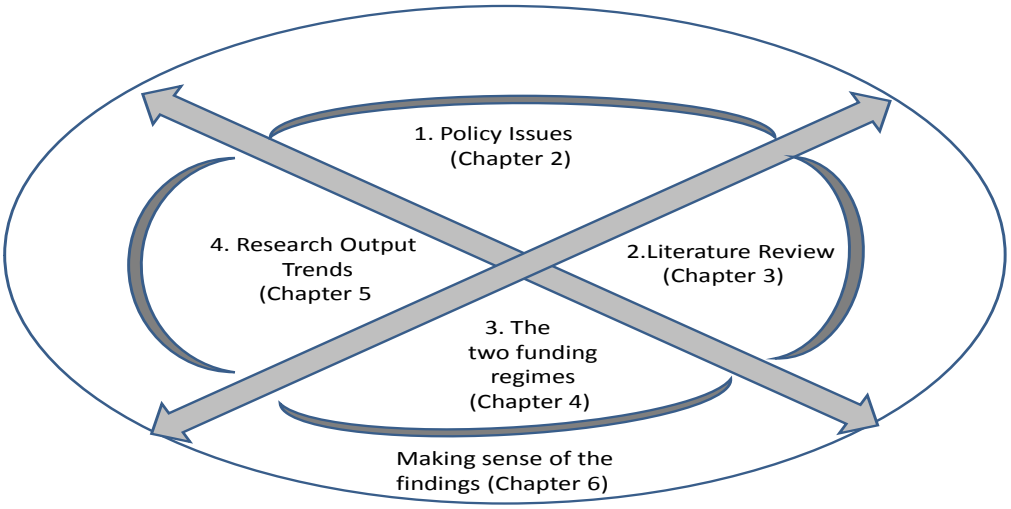
The chapter has explained the research problem, objectives and research questions, outlined the hypothesis and the significance of the study. The research problem is concerned with the government's instrument of measuring knowledge production, i.e. research output as a portion of accounting for public funds. Measuring knowledge production in the form of research output is not a simple matter. While there is no consensus about the single instrument for measuring knowledge production, the NFF for public higher education institutions in South Africa prefers articles published in accredited journals over other types of output such as patents and artefacts.

The objectives of this study do not only provide direction for the research focus, they foreshadow how the study would be conducted, i.e. whether the qualitative or quantitative method or a combination of the two methods would be employed. The study has adopted a mixed method strategy, integrating both the qualitative and quantitative methods, as a means of comprehensively addressing the research problem.

The provisional hypothesis is derived from the research problem and may be stated negatively or positively (Auriacombe, 2001:21). Accordingly, the main hypothesis for this study is positive in that, it suggests that the research component of the New Funding Framework for public higher education in South Africa has positive effects on the knowledge production of higher education institutions.

In this chapter, a research strategy was presented as a means for cementing the foundation for the remaining chapters. The strategies to be employed include contents analysis, data mining, analysing research information systems databases, observation and review of statistical records. Now that the cement for the foundation of this thesis has dried up, the first layers of the project would be laid in the next chapter. Therefore, Figure 1.2. below shows the interrelationship of the chapters in contributing towards presenting a solid thesis.

Figure 1.2. The interrelationship of the chapters of this thesis



In conclusion, the focus should now be on mapping out the conceptual framework as presented in Chapter 2.

Chapter 2

…and this is where it started – policy issues

Policy gets made in response to problems. But what is perceived as puzzling or problematic is not predetermined or fixed for all time –Goodin, Rein and Moran[12]

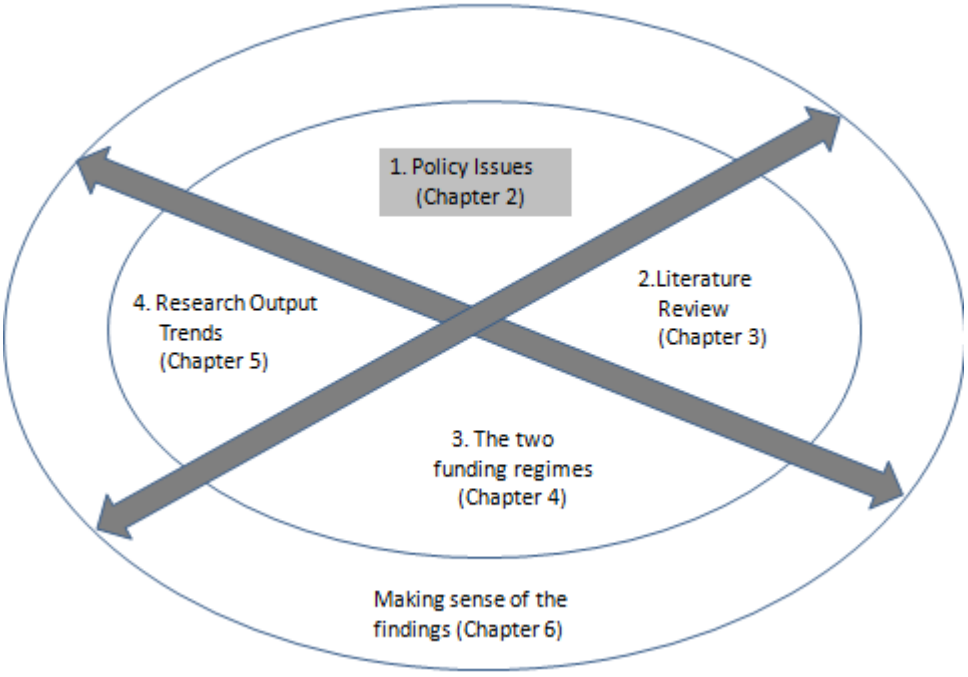
2.1. Introduction

In the last decade, South Africa has experienced the development of numerous policies in response to its transformation agenda. In the context of education, higher education institutions are increasingly expected to transform themselves in accordance with the state agenda, thereby translating their programmes in addressing the societal needs of knowledge production, service delivery and policy implementation. This study falls under the domain of public policy and is primarily concerned with higher education policy in the South African context. Chapter 2 is, therefore, aimed at providing a conceptual framework for the study. The chapter provides the working definitions of policy and policy analysis from the international Public Administration arena and further narrows them down to the South African perspective.

Not only does Chapter 2 concern itself with the definition of policy, but it also deals with the nature of policy change and the policy gap, policy analysis and its approaches, as well as policy implementation. In this thesis, policy analysis is conducted from an exploratory perspective. The conceptual framework provided in this chapter has contributed towards positioning this study in the context of public policy analysis. Figure 2.1. servers to graphically position this chapter as the first of the four main pillars of the thesis.

[12] Goodin, Rein and Moran have contributed a chapter entitled "The public and its policies" in Moran, M., Rein, M., & Goodin, R.E. (Eds.). 2006. The Oxford handbook of public policy. Oxford: Oxford University Press.

Figure 2.1. Chapter 2 (Policy Issues), the first pillar of the thesis



Since this study is aimed at exploring the effects that the research component of the NFF might have on the higher education institutions, it is of importance to set out this journey by conceptualising the policy gap, more especially from a developing country context.

2.2. Recognising the policy gap

Policy touches most of our lives; some in ways we appreciate and some in ways we do not appreciate (Edmondson, 2005:2). It is in this context that Cochran, Meyer, Carr and Cayer (1993:1) state that in public colleges and universities, learners benefit directly from decisions of policy-makers who, for example, dictate whether or not to build and maintain their institutions and to subsidise their tuition. The thesis is ignited from the perspective of recognising a significant gap between public policy and practice[13] in especially a developmental state context. The discrepancy between policy

[13] Practice is, according to Wagenaar, Cook and Cook (2003:143) a distinct dimension of public policy. It is a building block of any concerted human activity, both individual and collective, and that it cannot be reduced to anything else. For further reading on practice, see Wagenaar and Cook , in Hajer and Wagenaar (2003).

and practice is a recurring theme in education policy studies, especially in developing countries where implementation discourse enjoys considerable attention in the literature (Elmore, 1980; Sayed, 2002; Sayed and Jansen, 2001).

A significant number of authors have shed light on the policy gap discourse. For example, Scott (1999:317) reports that there is a serious mismatch between the interests of higher education researchers and the agendas of policy-makers and, to a lesser extent, practitioners. In many countries there appears to be an imbalance between the aspirations of higher education researchers and the expectations of those policy-makers and practitioners – who either do not regard higher education research as sufficiently rigorous or, if they do, believe that much of the research which is produced is only marginally relevant to their needs (*ibid*.).

Other authors contributing on the policy gap discourse are Sayed and Jansen (2001), as they are stressing that the "policy gap" reflects the mismatch between policy intentions, policy practice and policy effects. Maasen and Cloete (2002) contend that studies on policy implementation showed convincingly that policy outcomes were hardly ever the same as the policy intentions. In their closing argument, Maassen and Cloete (2002:21) argue that:

> *… there is a wide, and in many respects widening, gap between politics and political programmes on the one side, and the dynamics of public sectors such as higher education on the other. Policies are expected to fill this gap, sometimes being directly derived from a political programme, sometimes reflecting societal reality, sometimes a combination of both. It is obvious that the wider the gap, the more likely it will be that policy outcomes will not be in line with the original policy objectives.*

According to Brynard (2007:358) the policy gap is what transpires in the implementation process between policy expectations and perceived policy results. The policy gap is according to Sayed (2002) a persuasive and seductive line of critique. In some instances, good policies might be seen as difficult to implement by personnel who do not have the required knowledge and skills to implement such policies. In South Africa, the policy gap highlights the difficulty that the new government has faced between 1994 and 1999[14] in matching intention with outcome, and rhetoric with practice.

Manganyi (2001:27) points out that the nature of public policy, its development and subsequent implementation in real time, is one of the most important features of defining democratic societies and, more specifically, of those in transition. The policy gap, therefore, cannot be divorced from an understanding of the contextual realities in which the new Ministry of Education in South Africa has found itself after the 1994 general elections. Although the focus of this chapter is on the policy gap, a definition of the term "policy" would assist to lay a foundation for the policy gap discourse.

2.3. Definition of policy

Policy is defined in various ways, since there is no single definition of policy which is universally accepted. The definitions of policy are aplenty and derive from diverse disciplines such as Education, Political Studies, Philosophy, Anthropology and Public Administration. For the purpose of this study, the definitions of policy are mainly derived from the Public Administration discipline. Scholars in the field of Public Administration have coined various definitions. For example, Cloete and Wissink (2000:3) define policy as "a statement of intent" and, further explain that "policy specifies the basic principles to be pursued in attracting specific goals".

[14] In South Africa, the period between 1994 and 1999 is viewed as a time of policy review and development for the new democratic government.

Furthermore, Cloete and Maassen (2002: 484), elaborate that policy is a form of explicit and deliberate governmental intervention. It is very important that policy-makers design a policy in such a way (through experiments) that the effects of the intervention can be assessed; in other words, that knowledge about which measures and instruments work, and which do not work can be increased. It is risky to make any statements, or come to any conclusions concerning interventions and their effects, without using experimental or quasi-experimental research methods.

Theodoulou and Cahn (1995:201) define policy as what the government says and does about perceived public problems. Taylor, Lingard, Rizvi and Henry (1997:35) concur by explaining that policy may be defined as whatever governments choose to do, or not to do. Cloete and Maassen (2002:483) stress that policy often responds to, or follows (i.e. regulates, adapts, finances, broadens, or limits) changes that are happening in practice, instead of being the outcome of unidirectional, state-centred political considerations and compromises.

A deduction from the foregoing definitions is that policies are developed to address specific concerns or problems. In other words, policies are developed for specific purposes. In the same breath, when arguing that definitions of policy are sometimes crafted for a particular purpose, Wilson (2006:153) cites a British Government White Paper on Modernising Government in 1999 as having defined policy as:

> *The process by which governments translate their political vision into programmes and actions to deliver 'outcomes' – desired changes in the real world.*

Furthermore, Wilson (2006:153) posits that policy may relate to the principles and priorities which a government adopts in relation to an issue, and not to their translation into action. Policies are drawn to bring about change of the *status quo*. They contain broad guidelines, methods and

procedures to encourage concerted efforts toward the attainment of stated goals. Knoepfel, Larrue, Varone and Hill (2007:21) write that all policies aim to resolve a public problem that is identified as such on the governmental agenda. Thus, they represent the response of the political-administrative system to a social reality that is deemed politically unacceptable. From this perspective, more especially in the educational context, Hall and Hord's 1987 definition of policy still remains classical when they state (Hall and Hord, 1987:183):

> *A policy is a rule or guideline that reflects or directs the procedures, decisions, and actions of an organisation and individuals within it.*

However, Wilson (2006:153) argues that not all policies are about bringing about change. In some cases, the objective of a policy is continuity.

In analysing various definitions of policy as provided by prominent scholars, De Coning (2000:13) has among others made the following deductions:

a) The fact that policy is a functional perspective on the process of government;
b) The fact that policy is not always deliberately conceived and written down, but it is frequently subconsciously accepted and may be unwritten, and that an allegation that no policy exists is in itself an indication of a policy approach to an issue or problem;
c) The need to consider various definitions in the field, from which particular relevant elements may be selected, rather than a single (oversimplified) definition; and
d) The emphasis on lateral approaches and multidisciplinary application.

In relation to my research topic, the definition of policy is borrowed from Wilson (2006:154) in which he states:

Policy means the actions, objectives, and pronouncements of governments on particular matters, the steps they take (or fail to take) to implement them, and the explanations they give for what happens (or does not happen).

In most of contemporary studies in Education, policy is conceived in terms of multilateral, national, provincial, or local directives that legislate institutional structures, proper codes of conduct, and academic standards for schools (Levinson and Sutton, 2001:5). David (2001:242) elaborates that policies set boundaries, constraints, and limits on the kinds of administrative actions that can be taken to reward and sanction behaviour; they clarify what can and cannot be done in pursuit of an organisation's objectives. The definition of policy is often complemented by outlining the nature of policy change. For purposes of this study, the nature of policy change is coupled with a discussion on the policy gap.

2.4. The nature of policy change and the policy gap

To understand the nature of policy change and the policy gap in the South African context and its relevance to my research topic, it is important to peruse published literature on the two concepts. In the policy domain, various changes can be observed. However, such changes are not only prevalent in South Africa but are observed globally. A notable, but not by any means the most significant change in the policy domain, is democratisation. The change is according to Scott (1999:322) most obvious in South Africa, central and eastern Europe and the former Soviet Union, where it has taken the traditional form of authoritarian state structures being replaced by democratic ones, although its effects can also be observed in most developed countries (albeit mediated through consumerist populism). The National Commission on Higher Education (1996) is of the opinion that the process of democratisation in South Africa has stimulated higher education reform – because such reform is crucial not only from political

enlightenment and intellectual liberation but also for stimulating the development of less liberal social reforms and, more contentiously, of free-market economics.

In South Africa, changing from an oligarchic racial state to an inclusive political democracy in 1994 has according to Fataar (2003:32) been the key determinant in shaping the higher education policy field in the contemporary period. The specific social dynamics, relations and interactions in the period leading up to and beyond 1994 delimited the contextual policy terrain. Policy has been the outcome of dynamic and complex processes within this policy terrain (*ibid*.). Policies developed between 1994 and 1999 relied heavily on the major changes taking place in respect of institutional mechanisms such as the merging of some higher education institutions for policy development, integration and coordination. The period starting from 1994 has been characterised by wide-ranging and fundamental policy and legislative reforms. After the 1999 election, the institutional structures established during the first five years of democracy were reviewed and modified in the light of their effectiveness or lack thereof. Such reviews led to continuous surveys on policy practice, more especially from the implementation perspective.

The purpose of implementing new policies in the education system is often associated with the need to effect changes. Therefore, there is an assumed direct link between policy implementation and change (Ball, 1990:14). Implementation of policies can, in this sense, be viewed as the actual task of putting theory into practice. In support of Ball's point of view, Hargreaves, Liebermann, Fullan and Hopkins (1998:6) stress that policies are useful when they can influence the allocation of resources, the structure of schooling and the content of practice. My contention is that public policy-making, however challenging it may be, is a necessity, especially in the context of developing countries or new democracies. Dye (1995:312) posits that policy-making does not end with the passing of legislation. Policy-making culminates into policy implementation, which involves all of the

activities designed to carry out the policies enacted by the legislature. Henry (2001:295) further states that implementation is the execution and delivery of public policies by organisations or arrangements among organisations. Henry's point emphasizes that in most cases, policymakers are not necessarily policy implementers.

Recent surveys on policy and practice single out policy implementation as being difficult (Brynard, 2007; Cloete and Maassen, 2002; Darling-Hammond, 1998; Moran, Rein and Goodin, 2006). In education for example, it is argued that: one of the difficult issues in educational change is policy itself, not this policy or that policy, but the basic ways in which policy is conceived, developed and put into practice (Darling-Hammond, 1998). From the South African perspective, more especially in Public Administration, Cloete and Maassen (2002:452) reiterate that a policy process is dichotomised into policy design and implementation, and the assumption is that while the policy as such is fine, the problem lies in its implementation. As far as education is concerned, Fataar (2003:32) explains that higher education in the post-1994 period witnessed complex contestation over the substantive meanings of policy in the context of a plurality of competing interests.

From the Public Administration context, Brynard (2007:359) argues that sometimes policies set out to achieve ambitious targets which ultimately fall short of their desired outcomes. Again, from the South African experience, despite significant achievements in policy development, growing unemployment, poverty and inequality and shortcomings in service delivery have fuelled criticisms about the effectiveness of government policies to transform the conditions of the citizens, especially the poor. A significant gap between the adopted policies and their successful implementation can potentially explain some of the problems experienced with the delivery of the government's main transformation objectives. Yet, some of the policies

may be responsible for the continuous persistence of some of undesirable outcomes since the dawn of democracy in South Africa.

After attending a Cabinet *Lekgotla*[15] in July 2002, the then South African President (Mr Thabo Mbeki) voiced a concern that the challenge facing government was not to change government policies, but to ensure that they are implemented. President Mbeki's argument implies that the government acknowledges a major gap between policy and its implementation in respect of both the political intent and the implementation of legislation. In attempting to address the policy gap, Cloete (2006:247) suggests the use of continuous policy evaluation by stating that:

> *Policy evaluation or assessment should be viewed as a judging process to compare explicit and implicit policy objectives with real or projected outcomes or results or impacts.*

It is from the above context that I set up to fill the void of understanding the impacts that the new funding policy has on government agencies with regard to the improvement or retardation of knowledge production, more especially in the form of research output.

A number of writers have used policy change and policy reform interchangeably (Christie, 1998). With the realisation of a wide scope of policy reforms in government, policy analysts have studied the gap between policy and practice by focusing on two issues. The first argument is centred around the policies themselves (Cloete, 2006). According to Sayed and Jansen (2001), policies are poorly designed as responses to deeper national problems. In South Africa, analysts in this league (Chisholm, 1997; De Clercq, 1997, 1998; Christie, 1998; Sayed and Jansen, 2001) have criticised most reforms for being inappropriately borrowed from other countries (more especially educational policies) and

[15] The term "Lekgotla" is a Setswana phrase originally used to refer to a royal meeting or gathering. The term is increasingly assuming greater importance in South Africa as is it widely used to refer to non-routine Cabinet meetings.

not addressing realities on the ground. It is argued that many implementing agents (including universities and schools) concur by complaining that it is difficult for them to implement current policies due to them being overloaded, unfunded mandates, and the lack of policy alignment and/or strategic prioritisation.

The second argument relates to the implementation process that encompasses problems of capacity and resources that hamper policies from being properly implemented (CEPD, 2000; Cloete, Wissink and De Coning, 2006; De Clercq, 2001; Meyer and Cloete, 2000; Sayed and Jansen, 2001). While some policies are perceived to be wrong headed and therefore unsuccessful, some policies are seen as good but lack proper implementation. I view this situation as "*intention gap*" versus "*implementation gap*". Numerous factors that contribute to the implementation gap can be cited. Among others, the three broad factors can be singled out as:

a) Macro-economic policies and budgetary constraints;
b) Coordination problems between policy making and budgeting; and
c) Human resource constraints within the decentralised political framework.

A key problem according to Welton (2001:182), is that some of the managers who should be leading feel disempowered; they cannot see their way through, and feel deskilled and, in some cases, lacking acceptance by other stakeholders. In his analysis of the policy gap in the South African context, Brynard (2007:360) highlights financial resources and technical resources, along with the quality of human resources, as the key factors that contribute to successful or poor implementation of policies.

Meyer and Cloete (2000:247) are of the opinion that major policy change is almost impossible in public organisations without the administrative and political support of both senior management and political office-bearers.

Moreover, policies need wide national support if they are to successfully address the developmental needs of the country. In the field of education, Rogan and Grayson (2001:2) add that all too often, policy makers and politicians are focused on the desired outcomes of educational change but neglect the contextual factors that influence implementation.

My interpretation of the foregoing sentiments is that the idea of "good policy but bad implementation" might just be an excuse. Furthermore, Lahav and Guiraudon (2006) in Brynard (2007:362-363) reveal that a number of dimensions are apparent in the policy gap. Brynard stresses that these dimensions, according to Lahav and Guiraudon (2006:218) include the disjuncture between members of the public and policy makers at the decision-making and implementation stages; the relationship between policy goals and outputs; and the dynamics between the international and domestic arenas. The argument suggests that in many instances policy failure can be attributed to poor implementation or a lack of insight into the policy process. From the foregoing discussion, it can be argued that, over the past ten years the changing processes of policy making and policy reforms have, to a great extent, outrun the development of relevant implementation on the one hand while on the other hand, policy analysis and conceptualisation did not receive full attention.

Understanding and keeping abreast of the processes of policy-making, implementation and analysis is of importance not only for the policy scholars, but also of practitioners (political office bearers and public managers) as implementers of policies. According to Hüfner, Sadlak and Chitoran (1997:341-342) there is little doubt that knowledge generated from research and incorporated into policy-making and its implementation not only facilitates the rational attainment of expressed political or institutional objectives but also adds to their legitimation. Studying and comparing the challenges, experiences, and policy options by analysing various enactments at the national, regional, and international level is becoming an

important part of policy studies across policy related disciplines and also in the field of higher education.

Recently, a new wave of interest in policy studies, including policy implementation studies, has emerged from scholars in South Africa and abroad (Brynard, 2000:164). The South African Association of Public Administration and Management and the biennial Winelands Conference held in Stellenbosch in April 2008, are singled out as relevant examples of such interest. In a chapter on social experimentation for public policy, Weiss and Birckmayer (2006:841) mention the existence of the Association for Public Policy Analysis and Management in Oxford. Brynard (2000:165) continues to enlighten us that a common theory on policy implementation still has to be constructed. Yet, every year, policies are developed and implemented. The success by which policies are implemented is a matter of concern to both policy makers and the implementers alike. In order to address such a concern, policy evaluation becomes a crucial necessity.

2.5. Policy evaluation

Much of the policy evaluation literature has relatively little to say in relation to causality. For example, Sanderson (2000:440) explains that evaluation is concerned more with establishing whether policies and programmes achieve their intended effects rather than with understanding how they achieve their effects. Perhaps policy evaluation in South Africa needs to distinguish analytically between conceptual critique and implementation critique, a process which requires enough time. Legitimately so, Sayed (1999:4) points out that the implementation issue has been ignored (at least not fore-grounded) and has been a consequence of attempting to create the frameworks for change.

Policy implementation and evaluation are of relevance to my study on how public higher education institutions respond to the NFF. The means for

accounting for higher education funding and estimating the value of research output of universities has proved to be a controversial topic. Not only is it necessary to capture the quantity of output, which can be quite varied and given weight, but also the quality of the work must be accounted for (Abbott and Doucoliagos, 2003:92). Various policies on higher education funding have been legislated and implemented. It is, therefore, necessary to trace the effect that such policies has had on the production of knowledge by public higher education institutions. This process is referred to as, "policy analysis". A definition of policy analysis, therefore, is of relevance in shedding further light on identifying and addressing the policy gap.

2.6. Policy analysis defined

The preceding discussion on policy implementation and evaluation has uncovered the need to analyse policies. But before looking into approaches to policy analysis, a definition of policy analysis is worth noting. De Coning (2006:3-4) defines policy analysis as:

> *The systematic analysis of the dimensions and variables influencing public policy and is an indispensable part of policy management.*

It should, however, be noted that De Coning's definition of policy analysis falls short as it does not include policy effects. Policy analysis is according Dunn (1981:35) an applied social science discipline which uses various methods of enquiry and argument to generate and change policy-relevant information that may be used in political settings to resolve specific social problems or issues. Taylor *et al*., (1997:35) share the same view when they state that "policy analysis" may be considered as "the study of what governments do, why and with what effects". Cochran *et al*., (1993:3) explain that:

> *Policy analysis is principally concerned with describing and investigating how and why specific policies are proposed, adopted and implemented. Its main focus is on explanation rather than prescription,*

on searching scientifically for the causes and consequences of policies, and on general explanatory propositions.

The above definitions of policy analysis imply that the approach is explanatory and not prescriptive, and scientifically searching for the effects of adopting and implementing such policies. It is in agreement with the two definitions of policy analysis that my thesis follows the explanatory approach in analysing South Africa's new higher education subsidy policy. Before analysing a specific policy, the analyst should consider available approaches that might be suitable for rigorously analysing the policy concerned.

Hanekom (1992:71) is of the opinion that the policy analyst should:

a) Be provided with policy-relevant information, as far as possible without constraints;
b) Be conversant with the history and peculiarities of the policy he/she is analysing;
c) Bear in mind that good policy analysis is a rigorous assertion of information and entails the application of the scientific method of enquiry (what, where, when, by whom, how and why);
d) Remember that a multidisciplinary approach, incorporating different skills and different disciplines working together, is always more fruitful than attacking policy problems from a single perspective; and
e) Not be a passive, disinterested researcher; he/she must articulate his/her findings, which implicitly entails the articulation of his/her opinion, projecting him/herself into the arena of perspective policy analysis.

However, it should be noted that the approach to be adopted will depend on the type of policy that is sought to be analysed.

2.7. Approaches to policy analysis

Policy is never permanent or made once and for all. As a starting point, Goodlin, Rein and Moran (2006) view policies as puzzles. Puzzles get transformed into actionable problems, and policies get made on that basis. But that gives rise to further puzzlement, and the quest for ways of acting on those new problems (Goodin *et al*., 2006:28). According to Winship (2006:111), puzzling represents a type of rationality distinctly different from standard instrumental rationality. Although there is a specified end with a puzzle, one may only have an inkling of what that end will look like. That is, although the intended policy outcomes are known beforehand, it should also be borne in mind that some policies also yield unintended outcomes. The puzzling aspect of policies is exactly what concerns and keeps policy analysts in their art. Policy analysis takes the form of various approaches. Wissink (2006:77) has summarised the approaches as by means of the following table:

Table 2.1. Approaches to policy analysis

Analytical aspects	Analytical focus	Analytical instruments
Policy content analysis	Interpretation of policy content	Judicial practice
	Comparative policy analysis	Correlation of policy content
	Policy dynamics	Indicators of policy change
	Policy pathology	Problems and ailments of the policy process
Policy systems analysis	Policy behavioural studies	Influence and decisions of shareholders and stakeholders
	Policy institutional studies	Role of institutions and related organizations
	Policy process studies	Agenda-setting procedures of policy-making bodies and committees
Policy issue analysis	Policy problem structuring	Structure of the nature of policy problems
	Policy recommendation (advocacy)	Determining and forecasting policy solutions
Policy outcome analysis	Policy monitoring	The outcome of policy actions
	Policy impact evaluation	The value of policy actions
Policy values analysis	Community values and general morality or moral guidelines	Values and ethical considerations supporting specific policy choices and/or actions

Source: Wissink (2006:77)

In his full text, Wissink has elaborated on each of the approaches summarised in Table 2.1. I would therefore concentrate only on a few that inform the conceptualisation of this study. Suffice it to start with policy content analysis, since chapter four of this thesis draws its direction from

this approach. Accordingly, Wissink (2006:78) enlightens us that the aims of content studies are descriptive, i.e. to inform policy makers and students of the characteristics of political units that are normally associated with the adoption of different types of policy.

Put another way, content studies are concerned with how similar types of policy (policy areas) are structured in different environments, and how they change and adapt over time (*ibid*.). While Wissink emphasises the descriptive nature of content studies, my approach in policy analysis is more of a critical nature than merely being descriptive. Chapter 4 of this thesis is, therefore, aimed at critically comparing the current policy on higher education research output funding with its predecessors developed in the 1980s.

The second approach that has influenced this study is policy outcome analysis. Wissink (2006:79) explains that outcome analysis is an approach to policy analysis that assesses what effect policies actually have. He further elaborates that policy outcome analysis has two distinct phases: monitoring policy outcomes and evaluating policy performance (impact assessment). In following the policy outcome analysis approach, Chapter 5 of this thesis is directed at studying the effects that the research component of the NFF has had on knowledge production.

2.8. The South African experience and this thesis

In the South African context, the national policy approach acknowledges that the redress of past inequalities in education cannot be achieved “unless the negative impacts on the education system associated with globalisation, in particular human resource development, high-level skills training and the production, acquisition and application of new knowledge are addressed” (Ministry of Education, 2001). However, in South Africa much attention has

been focused on policy formulation[16] without indicating how to translate such policy into measurable outcomes. The National Treasury is an exception in this regard, as it has a better approach in the way budgets are compiled. Brynard (2007:363) concurs by stating that in the 1990s, South Africa was predominantly at the stage of policy formulation.

The second term of the democratic government has largely shifted the focus to policy implementation. In fact, South Africa has an impressive compendium of education policies that were widely acclaimed throughout the world (Sayed and Jansen, 2001:6). However, good policy does not automatically produce good results. Porter (1980:75) argues that the people concerned with creating policy and enacting relevant legislation seldom look down the track of the implementation stage.

The South African government is facing the dual challenge of consultative and democratised processes vying with the need to implement policies speedily and successfully (Brynard, 2006:363). For example, since 2001, the DoE has implemented the new policy for funding higher education institutions in South Africa. An institution's research output grant for any funding year is dependent on (a) actual totals of research graduates and research publication units for the year, and (b) a normative total which it should have produced in terms of national benchmarks (Ministry of Education, 2004:12). This study seeks to explore the effect that the research component of the new funding policy might have on knowledge production.

The research topic was chosen in order to compare and contrast the implementation of the new funding policy, with its stated goals, and the manner in which such a policy gets interpreted and responded to by various implementers in the higher education contexts. Brynard (2007:364) argues

[16] See Christie 1995; Sayed 1997 & 1999; and de Clercq 1997.

that not only should the South African practice of policy implementation receive attention by policy-makers, policy implementers and policy scholars, but so too should mainstream research in policy implementation. Given that some government and public officials are lagging behind with the intricacies of the implementation process, the argument is vital for the successful delivery of policy goods and services in South Africa. Moreover, the policy process does not end with implementation, it is also necessary to establish the impact that the policy has. In other words, there is a need to analyse the effect that the policy has had on the environment it is aimed to influence.

Finally, despite the South African government's significant achievements in policy development since 1994, shortcomings in the implementation of education policies in particular and challenges of service delivery in general have fuelled criticisms with regard to the effectiveness of public policies. It should thus be noted that the effectiveness of policies largely depends on the substance of such policies as well as the ability of the government to efficiently implement them. In summary, it can be concluded that a gap between the developed policies and their successful implementation can be a source of explanation of some of the problems that the government experiences in realising its transformation agenda.

2.9. Conclusion

In conclusion, Chapter 2 has formed the second leg of the building project, that is, the laying of a foundation on which to erect the walls of this thesis. Concentration has been on providing a conceptual framework for the study. Accordingly, the chapter was started by outlining policy change in South Africa since 1994, a period that has been characterised as transition from the old dispensation to the new democratic government. During this period, South Africa has seen the introduction of new policies including the *Higher Education Act, 1997 (Act No.101 of 1997)*, which was aimed at transforming the higher education system in the country. A significant gap between policy

development and policy implementation grew since concentration on how to translate policies into practice was overshadowed by the need to develop new policies while terminating the outdated sets.

The study was started from the perspective of recognising a significant gap between public policy and practice in especially a developing country context. The “policy gap” has reflected the mismatch between policy intentions, policy practice and policy effects. The policy gap discussed in this chapter prompted the need for the definition of policy as well as an exploration of policy analysis. In exploring policy analysis, lessons learned from the South African experience were highlighted. The chapter was cemented by means of an overview of approaches to policy analysis.

Before analysing the effects that the new funding framework for public higher education institutions in South Africa (as per the *Higher Education Act, 1997 (Act No.101 of 1997*)), it is important to conduct a literature review as a basis for grounding this thesis in the context of scholarly discourse. A literature review is therefore presented in the following chapter (Chapter 3), thereby laying the reinforcements for Chapter 4.

Chapter 3

What other authors had said before – Literature review on knowledge production, the knowledge society and the economics of higher education

In our economy-driven time, the return on investment in science and higher education in its current form is indeed questioned –Jacob Nüesch[17]

3.1. Introduction

Knowledge has become the currency of the new global market; the most successful societies in the future will be those that optimise the creation, distribution, and utilisation of knowledge (Rhodes, 1999:167). To add to this discourse, Lillejord (2005:1316) reports that today the wealth and prosperity of nations increasingly is assumed to be dependent on information, knowledge, and creativity. Economies across the world increasingly rely on knowledge to achieve sustainable growth and competitiveness in global markets. Therefore, it is not surprising that knowledge generation through formal learning processes such as research and development has intensified, and the ability to produce it is increasingly recognised as critical for any economy (Conceição, Heitor, Sirilli and Wilson, 2004:553). It is against this background that Chapter 3 of this thesis is set out to explore literature on knowledge production on one hand and the economics of higher education on the other hand.

A literature review is the most essential part of the preparatory work that needs to be undertaken in the initial stages of research. Moreover, the point of doing research is to do something no one has done before, and in the

[17] Jacob Nüesch contributed a chapter on higher education in the twenty-first century in Hirch, W.Z., & Weber, L.E. 1999. *Challenges facing higher education at the millennium*. Phoenix: The Oryx Press.

process discover new truths, expand the existing knowledge base and encourage creativity. Egger and Carpi (2009:1) write that when scientists present their new ideas and results to the community, they are expected to support their ideas with knowledge of the scientific literature and the work that has come before them. In short, the scientific literature is of central importance to the growth and development of science as a whole. Therefore, the starting point for scientific research is to conduct an extensive literature review.

For research to be successful, literature has to be systematically analysed to ensure that the knowledge gained has been effectively gathered and appropriately compiled (Majam and Theron, 2006). Holmes (1987) as citied by Egger and Carpi (2009:2) states that:

> *The literature of a specific speciality area is the accumulated corpus of research articles contained in the journals of the field, and it is regarded as the primary repository of the knowledge that defines the state of that field*.

In his definition of literature, Holmes has made an omission of other important vehicles of research communication such as books and conference proceedings.

The purpose of the literature review for this study is to establish what is already known about the effects of higher education funding frameworks (with special emphasis on knowledge production, economics of higher education, and higher education funding frameworks), to investigate the empirical claims of this published literature, and to identify the weaknesses or limitations of this knowledge.

The literature review for this study is primarily concerned with the subjects of knowledge production and the subsidisation of higher education

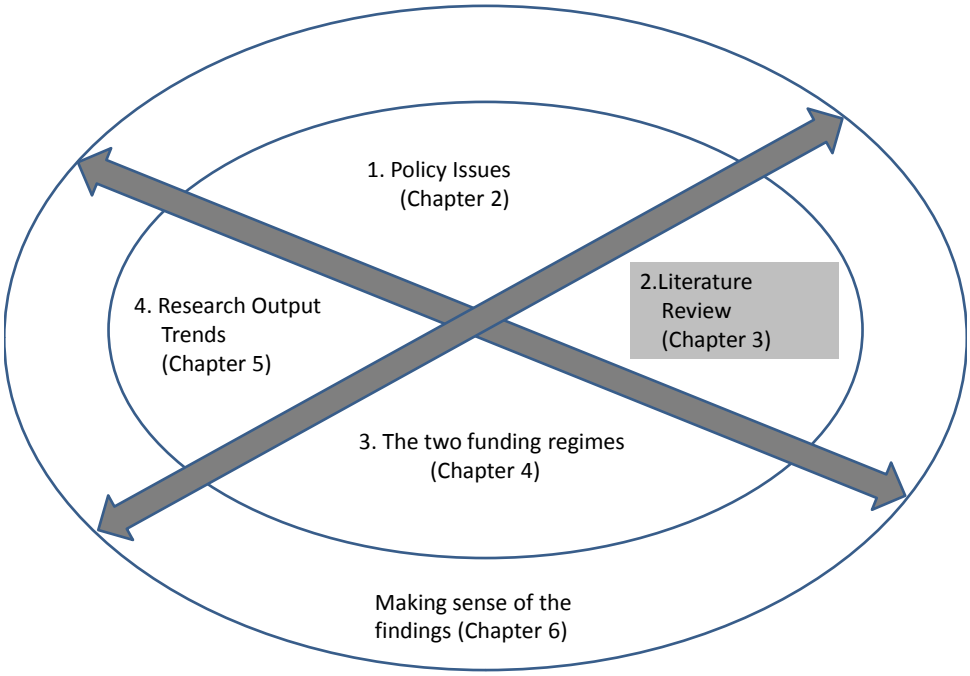
institutions by the state with special emphasis on the research component of the new funding policy. As far as the policy environment is concerned, Abbott and Doucouliagos (2003:92) remind us that policy makers and the general public are concerned with the issues of efficiency and human capital formation processes, and that information on these processes is important. As such, the literature study is also concerned with the effectiveness of policy, particularly higher education policy.

While Mouton (2001:87) explains that literature review provides substantially better insight into the dimensions and complexity of the problem, Hofstee (2006:93) stresses that what needs to be done here is to locate the researcher's work in the work of others. In line with the two sentiments, the literature review for this study serves as the basis for justifying my particular research focus. The scholarship on which the literature review is based comes from diverse subjects including Public Administration, Education, Economic Sciences, Information Technology, Engineering, Law and Social Sciences. Knowledge production cannot solely be attributed to one scientific discipline. It cuts across all disciplines. This study is no exception. It also straddles the disciplines of Public Administration, Education and Policy Studies among others. This study is important for a number of disciplines. In summary, Majam and Theron, (2006) are of the view that literature review provides a framework for establishing the importance of the study, as well as a benchmark for comparing the results of the study with other findings. They further conclude that:

> *The review helps the researcher to gain expertise on the topic she/he has selected to study. Moreover, problems and research questions can develop from the reading of other studies. In this sense, the literature review shares with readers the results of other studies that are closely related to the study. It also relates the researcher's study to the larger, ongoing debate in the literature about the topic, filling in gaps, and extending prior studies (Majam and Theron, 2006:604).*

The focus of this literature review is fourfold. To provide a contextual framework, the review commences with dimensions in the knowledge production literature, before flowing into the economics of higher education. Then, the review presents some background on the higher education framework, especially from the South African perspective. The last focus of the literature review is on tracing methodologies and the history of measuring research and knowledge production. The chapter on literature review should, in relation with Chapter 2 (conceptual framework), be viewed as the second of the four main pillars of this thesis as shown in Figure 3.1.

Figure 3.1. Chapter 3 (Literature review), the second pillar of the thesis



In laying the first line of bricks for literature review, candidate articles were limited to those having the terms “knowledge production, New Public Management, economics of higher education, performance management, measurement, assessment, and evaluation of research output” in their titles and sub titles. The process limiting the literature search has provided a useful departure since literature review has proven to be a challenging

task. From the identified articles, I have selected only those that were published from 1991 to 2006. I have particularly excluded letters, editorials and reviews since the DoE in South Africa does not recognise such publications as research output. The DoE views such output as opinions or views that cannot be justified as scientific research. However, it should be noted that this is a contested view since in some disciplines like the natural sciences such output is strongly regarded as part of the scholarship. Books and articles that are not written in English or Afrikaans were also excluded as it may be time consuming to identify and translate them into English.

The selected articles led to the discovery of other relevant sources that do not have the above-selected words in their titles, thus bringing in a broader pull of literature sources. The starting point for the literature review is, in this sense, on the subject of knowledge production.

3.2. About knowledge production

In the knowledge society the generation, innovation, processing, transformation and dissemination of information are the most fundamental sources of power. It should, however, be noted before deliberating on knowledge production, that knowledge is a very complex and elusive concept. Boden (1996:48) postulates that the study of knowledge from a philosophical context, i.e. epistemology, continues to be studied. Today, epistemology even features in scientific and engineering contexts in fields that include artificial intelligence and artificial life. Although knowledge production is crucial to the society and higher education, it cannot be measured directly. In essence knowledge is the outcome and not an output of the scientific research process. However, there is the output of the scientific research process which can be used as a valid indicator of knowledge production, namely, the research output units that feature in the new funding formula. Therefore, in this thesis that deals with

knowledge production research outputs of higher education institutions are used as a measure of knowledge production. Also see Section 3.6 ("Contextualising knowledge production").

According to Adams (2004:30) knowledge is the modern currency of public policy. It is made up primarily of facts and ideas and values which, when assembled in particular ways, guide[18] judgements about what to do. It should, therefore, be emphasised that an important characteristic of knowledge (more especially from a public policy perspective) is the creation of meanings that guide action.

Research has shown that there is sufficient consensus that the most prestigious resource in the "*society of knowledge*" is the human being; as such, the "producer" of knowledge, and, in the majority of cases, the processor, user, and communicator of knowledge. Increasingly, we realise that knowledge is appropriated in different ways. In this line of thought, knowing is regarded as participation – knowing things, facts and rules – it is "appropriating" them in some manner, including them into our field of orientation and competence (Stehr, 1996:13). Lillejord (2005:1318), adds that this process simultaneously opens for a new kind of knowledge for scholars; knowledge as understanding or reflection. Subsequently, knowledge is more than theoretical and practical insights; basically it is a reflective process, a transformative and critical activity. I share the view of the two scholars that knowledge should not only be perceived in its formal state. Knowledge is also acquired by means of informal ways such as in observation, experience and listening to conversations including news bulletins. For example, in the pre-modern society knowledge was passed from one generation to the next by way of storytelling, also referred to as the oral tradition.

[18] That guidance includes an explicit or implicit theory of action – that is, what causes somebody to act.

Humans, both individuals and groups, are capable of interpreting and integrating knowledge to transform it into patterns of behaviour, decisions, and initiatives (Blasi, 1999; Hillman, 2003; Van Buuren and Edelenbos, 2004) and are in a constant state of reconstructing their worlds (Subotzky, 1999; Tierney, 1996). A deduction can thus be made that, even though knowledge can be acquired from the same source, it is perceived and interpreted in different ways. Again information derived from the same source can influence the behaviour of human beings in diverse ways.

To shed more light on knowledge interpretation and integration, Hillman (2003:78) writes that people react differently when they know that other people know. In agreement of Hillman, I would like to add an example that, if one knows that he is suspected of wrong doing, that person will act in an acceptable manner, otherwise he will be exposed. Furthermore, Van Buuren and Edelenbos (2004:291) explain that knowledge is the outcome of social processes and institutional guided actions of researchers. In agreement with Van Buuren and Edelenbos, I am of the opinion that knowledge obtained from literature review positively contributes towards guiding the actions of researchers. Researchers are able to refute facts or substantiate their point of view, based on the knowledge obtained from the literature they have read.

Zegeye and Vambe (2006:334) argue that there is no society within which knowledge production does not take place. To add to the discourse, my contention is that, even in the illiterate communities, knowledge production does take place. There is no justification that knowledge is only embedded in the literate societies. However, I do acknowledge that the literate communities have an added advantage of being able to document and preserve the acquired knowledge. Literature on knowledge production is well documented and can be traced from the definitions of knowledge to analysing the purpose of university education. The next session is,

therefore, focusing on the definitions of knowledge in the context of knowledge production.

3.3. Knowledge production as a collaborative phenomenon

According to Foray (2004:49), knowledge is produced in different ways that can be defined in terms of a dual dichotomy. He explains that first, there are two main ways in which new knowledge comes into being: first, through formal research and development work *off-line* (i.e., "isolated" and "sheltered" from the regular production of goods and services); second, through learning *on-line*, where individuals learn-by-doing and, as a rule, can assess what they learn and hone their practices for what follows. On the one hand, the generation of knowledge may involve search processes within domains that are relatively unexplored or underexploited. Foray's explanation excludes informal acquisition of knowledge. His explanation is focusing on knowledge that is produced by means of research activities.

Foray (2004) elaborates that, on the other hand, the processes of increasing complexity in industrial architectures involve somewhat different needs for the systems of knowledge generation. There is a need to produce "*integrative knowledge*", such as norms, standards, and common platforms. These processes comprise a coordination model of knowledge generation. In challenging Foray's view, it can be argued that norms and standards do not entirely need formalised and complex processes. From Foray's analysis, it becomes apparent that a definition of knowledge production is necessary. But, before outlining the definition of knowledge production, it is of vital importance to throw in some definitions of the term "knowledge", more especially from but not limited to, a Public Administration perspective.

As a point of departure, Scott (2006:73) defines knowledge as anything that is known by a person and knowledge production as the act of acquiring new knowledge, as well as the act of communicating existing knowledge to new minds. According to Brelsford (2005:2) knowledge begins with an attempt to understand some particular aspect of experience that someone happens to consider troubling or curious or otherwise attention provoking. Knowledge becomes knowledge as other particular persons come to share in (or affirm) a particular understanding of a particular aspect of experience (*ibid.*). In comparison with Foray's earlier definition, the two authors' explanations are inclusive of both formal and informal was of knowledge acquisition. I am sharing their line of thought in interpreting knowledge acquisition.

In the African context, Zegeye and Vambe (2006:335) define knowledge as a manifestation of the people's struggle with nature and with each other. This knowledge is carried from one generation to the other through popular songs, folktales, myths and legends *(ibid.*). I have earlier on mentioned the "oral tradition" as a means of passing knowledge from one generation to the next. African societies have long relied on the oral tradition and continue with the practice to date. In the African culture, storytelling plays a vital role in honing comprehension skills and knowledge sharing skills. My other argument is that knowledge is often developed and accumulates in the context of learning-by-doing or learning-by-using.

From the Public Administration point of view, Wessels (2005:1501) argues that not all knowledge is part of science; in other words, not all inquiries by means of methods originated in science lead to scientific knowledge. Interestingly, Wessels cites an example of the telephone directory; in which rational, systematic, and objective information about the telephone number of a specific individual is communicated. In support of Wessels, I would like to point out that being systematic does not necessarily translate

into being scientific. Listing surnames of people alphabetically and according to specific geographic areas is systematic but not scientific.

In Public Administration, many scholars have shed light on the critical and vexatious government-science relationship. This thesis acknowledges a distinguished and long time Public Administration scholar and practitioner, Don K. Price as the first noted contributor to the government-science relationship. Price's 1965 book "*The Scientific Estate*" was one of the earliest works to give a detailed view on the subject. The discussions on the scientific-government interface and knowledge production in the Public Administration discipline draw much from Price's contribution.

Knowledge can be acquired from a variety of avenues, disciplines, situations and experiences. Bless and Higson-Smith (1995:1) argue that there are many ways of acquiring knowledge and the least mentally developed human being, the child, does not carry out sophisticated research in order to develop some understanding of the world around it. Again, using the oral tradition thesis, it can be argued that telling stories or singing lullaby's to children affords them the knowledge on how to react in certain situations. From this perspective that Brechin and Siddell (2000:14) highlight the three ways of knowing as:

a) *Empirical knowing* – the most explicit form of knowing, which is often based on quantitative or qualitative research study;
b) *Theoretical knowing* – which uses different theoretical frameworks for thinking about a problem, sometimes informed by research, but often derived from intuitive and informal way; and
c) *Experiential knowing* – craft or tacit knowledge built up over a number of years of practice experience.

I therefore, also acknowledge the thesis stating that "*not all knowledge is scientific*"[19]. The statement qualifies Parker, Guthrie and Gray*'s* (1997) point of view where they argue that academe's primary distinguishing feature has been traditionally considered to be the pursuit of scholarship. The value of scholarship is generally established through its dissemination, by means such as teaching, workshops, conversation, conferences and courses, and publication. My contention is that scholars (those in the fields of Public Administration, Education and Health Sciences, for example) have the urge making their contributions known, not only to their peers but to the policy makers as well.

Duderstadt (1999:43) cautions that the nature of knowledge creation is shifting somewhat away from the analysis of what has been to the creation of what has never been – stressing the experience of the artist rather than the analytical skills of the scientist. To elaborate on Duderstadt, I would like to point out that medical scientists around the world are currently avidly searching for a possible cure for HIV/AIDS. Whenever the scientists are convinced that they have made a breakthrough, they immediately communicate their findings to their peers and to the rest of the world. Their findings then become knowledge that can be used.

With relevance to policy-making, Van Buuren and Edelenbos (2004:289) conclude that it is recognised that knowledge is produced collaboratively. Knowledge production involves the participation of laymen and needs attention to be focused on the use of different sources of, and perspectives on, knowledge. In their closing argument, Van Buuren and Edelenbos (2004:292) state that:

> *The social processes surrounding the production of policy-relevant information are more in terms of quantity and intensity than in the case of production of fundamental research, because knowledge is*

[19] That is, there is common knowledge, which means that people know each other, and also that people know that people know, and they know that they know, and so on.

constructed in close contact, and sometimes even interactively with end users.

An acclaimed author on knowledge production is Michael Gibbons. Gibbons (2000:42) writes that knowledge production is increasingly a socially distributed process. Moreover, Gibbons elaborates that the locus of knowledge production is global. At its base lies the expansion of the numbers of sites which form the sources for a continual combination and recombination of knowledge resources (*ibid*.). In agreement with Gibbons, I would like to emphasise that knowledge is produced all over the world and is practically non-exclusive.

Standing on the shoulders of acclaimed authors such as Gibbons (Education) and Wessels (Public Administration), this study on the effects that the research component of the NFF has had on South African HEIs' knowledge production is relevant to the (end)-users of policies in the form of university research managers, as well as managers at both the DoE and the Council on Higher Education (CHE)[20].

On the subject of collaborative knowledge production, Hall (2004:1) stresses that wide access increases the productivity of the knowledge both as input to future knowledge creation, and as the basis for the production of new goods and services. Interestingly, Jacob (2000:140) observes that with all the positive attention being directed to knowledge and intellectual capital, the casual observer might be puzzled about the gloom and doom in the academy. Surely, if knowledge is the new fashion, then the university must be the most sought after designer (*ibid*.). Universities play a vital role in both the production and distribution of knowledge. The knowledge society is fundamentally driven by universities

[20] The CHE serves in an advisory capacity to the Minister of Education. Through its sub-committee, the Higher Education Quality Committee (HEQC), it conducts research and is responsible for quality assurance within higher education and training.

around the world. It is therefore, of relevance to revisit the purpose of a university.

3.4. Defining the purpose of a university

The relevance of this section to this chapter and to the rest of the thesis is premised from a statement by Crosier (2007:4) when he states that:

> *Universities are dealing with universal knowledge and societal and human challenges, and this responsibility has never been more apparent than today.*

Before deliberating on the purpose of a university, it is important to revisit the origins of the name "university". Dunbabin (1999:30) posits that despite their repeated submersion in Aristotelian logic, medieval intellectuals were not particularly good at recognising a new *genus*, a new class of objects, when it came into existence. He continues to elaborate that it took a long time before a common term for the emerging super schools can be adopted, although the popes referred to them as *studia generalia*[21], an ambiguous word that was predominantly used in legal terms to describe a university in the fourteenth century. Accordingly, Dunbabin (1999) elaborates that the noun *universitas*, used to describe any privileged corporate body, was not narrowed down to refer first and foremost to an academic community specialising in higher education before the fifteenth century. I therefore deduce that it was only after the fifteenth century that universities came to be known as institutions that specialises in the provisioning of higher education and research centres. The question then is: what is the purpose of a university, more especially in terms of knowledge production?

[21] Students and masters according to Dunbabin (1999) usually referred to their places of study as *studia*, a word which could also apply to other less elevated institutions.

In terms of the purpose of a university in relation with knowledge production, Lowe (undated) in Imenda (2006:249) writes that Plato envisioned the purposes of education as being: (a) vocational and technical; (b) professional and managerial; and (c) philosophical. Imenda (2006:250) concludes that his idea of a university is a place where the lost ideals of scholarship as leisure, reduced pre-occupation with business, interdisciplinary studies, and a community of readers are recovered. Traditionally, the mission of the university has been expressed in terms of the honoured trinity of teaching, research and service (Duderstadt, 1997, 1999; Gibbons, 2000; Hobson, Jones and Deane, 2005; McManus, 2007). In stressing the role of the honoured trinity, Duderstadt (1999:37) argues that the educational opportunities offered by the university, the knowledge it creates, and the services it provides are key to almost every priority of contemporary society, from economic competitiveness to national security, from protecting the environment to enriching our culture.

Although the honoured trinity has been stressed, research has been accorded a higher status, for it has been understood as the defining quality of academic work and perceived as pivotal to informed teaching (Coaldrake and Stedman, 1999; Pickersgill, Van Barneveld and Bearfield, 1998; Smith, 1999). In teaching, for example, Smith (1999:157) stresses that the use of research projects in both undergraduate and taught masters courses in science, has developed greatly and they have proved exceptionally good at developing the intellectual capabilities of students. It should also be noted that the mission of the university is not only to transmit knowledge mainly through teaching, but also to advance knowledge through research. Many analysts have argued that at the higher education level, the teaching and research functions are mutually synergetic. For example, Whiston (1994:163) stresses that each informs the other and in particular an active presence in the research milieu assists to improve the quality of teaching.

Again, Smith (1999:157) posits that in terms of the idealistic purposes of a university, a well-run modern laboratory research group – with undergraduates on final year projects, PhD students, postdoctoral research assistants, visiting scholars, and the academic leader of the group – is an excellent modern version of the medieval "community of scholars". The League of European Research Universities (2005:8) is of the opinion that an essential characteristic of university research is the competitiveness in winning resources from national and international funding bodies, in contrast to the assured resources and lower cost effectiveness in basic research of many specialised government research institutes.

Numerous authors have observed and highlighted significant changes in the development of the university as an institution and the way in which the production of scientific knowledge through research has evolved (Etzkowitz, 1994; Funtowicz and Ravetz, 1993; Gibbons, 2000; Webster, 1995). Perhaps the bureaucratisation of the university is the biggest change. Of critical importance among the observed changes, has been the ever increasing importance of knowledge production in the policy arena, such as in Education and Public Administration, although the policy makers do not always listen to scholarly advice. However, Gray (2001:4) observes that, the history of the idea of a university is one of continuing re-interpretation and re-adaptation in which the strongly felt need to assert a continuity with the past confronts the project of giving new life and form and purpose to the higher learning under circumstances quite remote from the past.

Interestingly, Cemmell (2003) has added a fourth dimension to "the honoured trinity". He distinguishes among four functions of higher education, namely; training of highly skilled workers, its development of new knowledge and research, its contribution to community service and an ethical function that may include social critique. Cemmell is not the

only proponent of a fourth dimension. For example, McFarlane (1999) has earlier referred to the traditional activities of a university as being research, scholarship, teaching and professional training. Professional training, long the nearly exclusive preserve of the universities, will become an essential component of lifelong learning (McFarlane, 1999:144). I subscribe to the scholarship of advocating the four dimensions of a university. Although professional training is a vital activity of universities, the focus of this thesis is on knowledge production.

Knowledge production is central to an economic environment in which knowledge, rather than other resources such as finances, laboratories and libraries, provides the competitive edge. Other resources might be available but not used as an advantage to sustain economic activities in comparison with knowledge production. Gibbons (2000:42-43) explains that universities in most countries are expected to contribute a share of the ideas on which national competitive advantage will rest, and to train the requisite scientific and technical manpower necessary to operate a modern economy. It is from this point of view that Teferra (2003:4) argues that universities remain the knowledge capitals of the nations on the African continent. They are the centres where a critical mass of highly trained and educated individuals pursue their intellectual duties; they are the hub for current scholarly, technical, and material resources; and they remain one of the major movers and shakers of the intellectual, academic, and scholarly direction and developmental agenda of a country.

Kerr (2003:97) postulates that the centrality of the university is now even more widely recognised, not only because the university adds to knowledge and extends the uses of knowledge in an age of ever newer knowledge, but also because political and cultural changes, in part, originate within it. The university has even been said recently to be the “paramount institution” in “post-industrial” society (*ibid*.). Also joining this discourse, are Malada and Netswera (2007:5) when stating that the boom

in the global knowledge economy has placed universities at the centre of some countries' economic development. Universities have become catalysts of the knowledge economy and breeding grounds for skills and expertise needed not only in industries, but in the public sector too (*ibid.*). In closing this discourse, I would like to sum up by highlighting the four main purposes of the higher education as seen by Taylor (1999:25) to be:

a) To inspire and enable individuals to develop their capabilities to the highest potential levels throughout life, so that they grow intellectually, are well-equipped for work, can contribute effectively to society and achieve personal fulfilment;
b) To increase knowledge and understanding for their own sake and to foster their application to the benefit of the economy and society;
c) To serve the needs of an adaptable, sustainable, knowledge-based economy at local, regional and national levels; and
d) To play a major role in shaping a democratic, civilised, inclusive society.

While contributing towards the competitive advantage of individuals and any nation, the university is also seen as a "multi-product firm".

3.5. The university as a "multi-product firm"

Universities face severe competition from other forms of education provision such as the Further Education and Training (FET) colleges – they face professionalization and industrialisation. Their current provision of an incoherent mixture of learning-for-life supplied through diverse social arrangements, and learning-for-work supplied through inefficient procedures separated from realities of the workplace, will face brutal competition from cost-effective, professionally-delivered learning-support providers delivering learning-to-work directly into the home or workplace at a time, in a location and in a style to suit the individual learner (McFarlane, 1999:142). Universities are in this regard, introducing a number of changes

to keep abreast of the developments as elaborated by McFarlane. Changes in the composition of the universities worldwide have transformed what was taught, who taught it, and how it was taught. Moutlana[22] (2007) stresses that:

> *We need to shift our focus from "how" to "how to". Graduates must leave with the skills required to go into employment and be able to add value. Our role is to produce graduates who are well skilled, entrepreneurial in their thinking and who have had experiential learning.*

Universities, wherever they are located, must be considered multi-product enterprises (Cohn and Cooper, 2004:579). From the American perspective, Goldin and Katz (2001:6) point out that the typical American university as it emerged at the beginning of the twentieth century was a veritable department store of higher education services. Various authors support this statement. Among the outputs produced in the typical institution of higher education are knowledge creation (research) and knowledge dissemination (teaching) (Cohn and Copper, 2004; Melck, 1982; Ward, 2002; Whiston, 1994); the public service function is another output; an active, usually non-formal, functional activity based on the scholarship of the university and directed to widely dispersed and varied audiences beyond the campus (McDowell, 2001; Wagner, 1993); another output related to the aforementioned outputs is social critique (Aitkin, 2001).

My contention is that the university plays an important role in society through comments by academics on social issues. The media often invites academics to participate in societal debates and present their analysis on important subjects like global warming, politics and health issues. Again university products are also made visible by means of non-academic

[22] Prof Irene Moutlana is the first black woman to be appointed vice-chancellor of the Vaal University of Technology (VUT) in Vanderbijlpark, South Africa.

channels such as talking at specialist conferences, writing for trade journals or the media and chairing community meetings.

One other important output of universities as multi-product firms is the production of researchers. Universities have become catalysts of the knowledge economy and breeding grounds for the skills and expertise needed not only in industries, but in the public sector too. They also train their own future workforce. However, it should be noted that for a university to perform the role of a catalyst in the economy optimally, it has to recruit and develop a critical mass of researchers to enable them to play this role (Malada and Netswera, 2007:05). Price[23] (2007:29) shares this view by stating that:

> *Universities have a critical contribution to make to the national developmental agenda. Paradoxically, we face a worsening skills shortage in the midst of growing graduate unemployment. The dearth of skills is being felt so acutely by the corporate sector that, for the first time, it appears willing to put serious money into higher education if it can get guaranteed quality graduates in return.*

Malada and Netswera (2007:5) further argue that it is pricy to recruit and invest in staff, as well as provide adequate and necessary research support systems underpinned by the principles of competition against other institutions and other countries. As the sector shrinks from 4.6% of the national workforce in 2001/02 to 2.2% in 2002/03 to 2.6% in 2003/04 according to them, South African universities find themselves in competition for the same skills with science councils, private research organisations and government departments, among others.

As “multi-product institutions”, universities are also faced with the challenge of producing enough researchers to feed the market demand

[23] Dr Max Price was announced as the new vice-chancellor of the University of Cape Town on Friday, 12 October 2007.

and to retain enough for their own survival. Some of the important indicators show that the number of researchers per 1 000 employees at South African universities is 1.5%, research output in the world share is 0,5%, research and development expenditure as a percentage of GDP in 2006 was at 0.92% and only four of South African universities appear in the tail end of the 500 top universities (*ibid*.). Since lecturers are also doing research, Malada and Netswera's use of the number of researchers per 1 000 employees as an indicator of research productivity might be misleading. A better indicator would be the % time spent on research of all the working hours at university. A discussion on the role of the university in knowledge production, especially as a multi-product firm, is incomplete without a further analysis of contextualising knowledge production.

3.6. Contextualising knowledge production

Knowledge production is very complicated when we take into consideration that policy processes have to deal with many stakeholders – not only policy-makers but also private companies and societal/ interest groups – with conflicting opinions about the desired cause of action (Teisman, 1995; Edelenbos, Van Buuren and Teisman, 2002). One of the resources mobilised by policy-makers, private entities and interest groups is scientific knowledge. Scientific knowledge requires a substantial capability on the part of the user, both in research and in the application of knowledge, which is often expensive to acquire and maintain.

Nowotny, Scott and Gibbons (2002) are of the opinion that scientific knowledge has become increasingly contextualised; a necessary development if it wishes to retain its relevance in a changing society. Moreover, knowledge production is essentially plural and contextual and generally, multiple: in that respect, this approach shares pledges for moving from uniformity and objective knowledge towards diversity and contextual knowledge (Hoppe, 1999; Teisman and Edelenbos, 2002).

Dundar and Lewis (1998:608) add that although productivity in higher education has an obvious multi-dimensional character as it relates to both knowledge production and knowledge dissemination through various forms of research, teaching, and outreach activities, research productivity in particular has received a great amount of attention and concern. Yet, Nowotny *et al.,* (2002:166) advocate a contextualised form of scientific research; interaction with interested parties as being crucial to produce the type of science that benefits society as they state that:

> *The increasing emphasis in the contribution of science to wealth creation (and social improvement), the growing defence to soc-called "user" perspectives, the great weight now attached to ethical and environmental considerations, are all examples of the intensification of what we call contextualisation.*

The following part of literature review is concerned with the knowledge economy. Understanding the concept of "the knowledge economy" is also of relevance to this study, since governments are investing huge amounts on education in the quest for socio-economic transformation of society. Furthermore, governments need to account for the funds they invest in knowledge production.

3.7. The knowledge economy

The concept of *knowledge economy* is understood to have two meanings. That is in the form of micro-economic and macro-economic meanings. From the micro perspective meaning of the knowledge economy, several authors purport that the formal education system serves as the principal institutional mechanism for the development of human skills and knowledge (Foray, 2004; Llorah, 2006; Winberg, 2006). From the macro perspective meaning, knowledge production is also referred to as "the knowledge economy"– an economy in which applied information is used

in all sectors to improve productivity and seek competitive advantage through innovation – has had a fundamental impact on universities as producers of knowledge.

Universities need not only keep abreast of socio-economic changes in the global environment, arising from the unprecedented rate of production of new knowledge and scientific or technological innovations, but also to find an appropriate place for themselves to flourish in this landscape (SAUVCA, 2002:6). Moreover, the League of European Research Universities (2005:35) argues that the global economy has changed dramatically in recent years. Mature, high-wage economies have moved away from traditional manufacturing towards high value, innovation-intensive products and high values services, taken to be characteristic of a "knowledge economy". Increasingly, they look to basic or frontier research as the source of new knowledge that gives the greatest competitive advantage.

Llorah (2006:81) emphasises that education also imparts values, ideas, attitudes, and aspiration, all of which contribute to nation building. It is therefore appropriate to stress that knowledge production, through teaching and research, enhances the stock of human capital. The stock in this regard, is valued in so far as the human capital stock can be applied to generate benefits such as more material products or people living a better life. However, in producing the stock of human capital, universities are influenced by various factors that need to be considered on a continuous basis. Tracing knowledge production in the fields of Education and Public Administration forms part of this research and will thus contribute towards strengthening the pillars on which the analysis of global knowledge production trends in the form of research output will rest. The knowledge output trends are presented and discussed in Chapter 5 of this thesis.

3.7.1. Knowledge production in Education and Public Administration

Research in Education - and, for that matter, in many other applied and practical fields – is increasingly being influenced by expectations from policy makers, politicians, funding agencies and practitioners to produce a particular kind of knowledge, *viz*., knowledge about "what works" (Biesta, 2005:1334). From a Public Administration point of view, Wessels (2005:1500) concurs by stating that the role of public administration is fulfilled within a changing context, for example, having to cope with new legislative and policy guidelines. Consequently, public officials are confronted with new problems that need hard-to-come-by knowledge to be solved, knowledge produced through the intervention of researchers trained in one or more of the various scientific traditions.

Wessels echoes the sentiments of Brewer, Douglas, Facer and O'Toole (1999:374) in which they argue that knowledge production by Public Administration scholars continues to be criticised as insufficient to meet the field's needs. Several critics have laid much of the blame on doctoral education, stating that it does not adequately prepare doctoral graduates to conduct basic research. Winberg (2006:161) writes that in South Africa, there is pressure for teaching and learning in the higher education sector to be seen to be knowledge producing and contextual, rather than knowledge "reproducing" and discipline-bound; and "trans-disciplinary" rather than limited to traditional sites of higher education.

Authors who have written on knowledge production, more especially in line with its effects on economic and policy relevance are few (Biesta, 2005; Imenda, 2005, 2006; Le Grange, 2006; Scott, 2006; Wessels, 2005; West, 2006). On the one hand, Wessels (2005) is concerned with knowledge production in the field of Public Administration, and on the other hand West (2006) concentrates on the fields of Accounting and Finance, while Scott (2006) tackles knowledge production in the Law

discipline. Biesta (2005) and Imenda (2005, 2006) are more focused on knowledge production and its relation to the idea of a university.

On a different tune, Le Grange (2005) is more concerned with the new modes of knowledge production. According to Prpiĉ (2007:491) the knowledge production mode has to be observed on the level of international scientific communities as collective producers of knowledge, but also on the level of national research systems, all the way to scientific organisations. Knowledge production is shaped by the actors' cognitive options and its social capital, the capital of strictly scientific authority (peer recognitions) or the capital of social authority delegated by a scientific institution (Bourdieu, 1991; 2004).

In its position paper, the South African Universities Vice-Chancellors Association (SAUVCA, 2002:2) observes that there are immense opportunities to pursue the key goals of public higher education in South Africa, including economic development, high level contributions to the knowledge economy, and the advancement of critical enquiry that is essential to a healthy democracy. Yet, Winberg (2006:161) argues that while there is a need for higher education practitioners to acknowledge that knowledge is being produced in a variety of sites, there is also a need to understand, both theoretically and practically, how different knowledge production systems function, and how they might productively interact with traditional higher education.

Despite strong policy directives, South African higher education institutions and authors have shied away from identifying and critically studying the effects and impact that the research component of the Department of Education's higher education funding policy may have on knowledge production. Perhaps the understanding of the goals of the university has contributed to this state of affairs. For example, Birnbaum (2002:53) states that the most important goals of the university are

education, the creation of knowledge through research, and public service – not the maximising of financial inputs.

Interestingly, Toutkoushian, Robert, Porter, Stephen, Danielson, Cherry, Hollis and Paula (2002:3) reveal that studies that address institutional-level knowledge productivity often base their analysis on teaching activities, and thus overlook the research activities of an institution. Prpiĉ (2007:491) rounds it off by stating that the main result of knowledge production is, naturally, research productivity. It is measured on the basis of self-reported information about published works (papers, books and chapters in books). Lillejord (2005:1316) argues that the practical aspects of knowledge are on the forefront, and researchers are supposed to be able to transform scientific knowledge into immediate practical use and value. I do not fully agree with Lillejord since not all scientific knowledge can be used immediately after production. Scientific articles sometime do take a long time before being popularly used and resurface after, for example, a decade and become frequently cited. Such articles are known as "sleeping beauties" for they were regarded as being asleep for sometime before waking up to their active citation (Van Raan, 2004:121). Authors of such articles are regarded as being ahead of the time. The literature on knowledge production drives us towards what keeps the universities ticking, that is, the economics of higher education.

3.7.2. Economics of higher education

The world economy is growing more competitive, complex and volatile. The economies of all countries, therefore, need to leapfrog into knowledge and innovation (Harkins and Kubik, 2006:103). Knowledge production is also driven by various incentives. In his analysis of the incentives for knowledge production, Hall (2004:1) argues that the starting point for thinking about economic policy for the knowledge

economy is that the production of information and knowledge is characterised by relatively high fixed costs and low marginal costs.

So, while higher education is generally a high priority in boosting economic development, public budgets to sustain expansion of higher education systems remain limited around the globe. This challenge is referred to as “fiscal stress” (Vossensteyn, 2004:39). Greenaway and Haynes (2004:298) share the same argument by stating that governments have become less capable of financing higher education expansion owing to increased competition for public funds[24]. In agreement with Vossensteyn (2004), Greenaway and Haynes (2004), I would like to state that, the more governments become less capable of financing higher education, the lesser will higher education contribute to the economy because of the stagnation (if not reduction) of knowledge production.

Higher education is critical to the social and economic future of developed and developing nations. Universities add to the stock of useful knowledge through their research, and disseminate that stock through their teaching, but what determines the amounts of each that they do is not fully established. The culture of a university system depends on the way that the higher education sector is funded (Beath, Poyago-Theotoky and Ulph, 2005:2). Pollitt and Bouckaert (2000:223) remind us that most Western countries have experienced an increased demand for new and different types of audit, evaluation and reporting systems that reveal and visualise output and outcomes of public sector organisations. Such demands resulted in the shift from allocating of funds on the basis of historical criteria to that of output/outcome-based mechanisms.

[24] Greenaway and Hayes (2004) report that until recently, this debate has been conducted at a very applied level. They cite De Fraja (2002) as an interesting recent theoretical contribution.

The reforms have been interpreted as an attempt of the state to use more systematic financial incentives to control organisational behaviour and to improve efficiency and quality (Geuna and Martin, 2003; Salter and Martin, 2001; Taylor and Taylor, 2003). Moreover, according to Weber (1999:11) the financing of higher education institutions in developed countries is becoming increasingly difficult for the following reasons:

(a) The public service is hard pressed with tasks mainly on the transfer side of the budget (e.g. attending to an aging population, health care, poverty, and foreign aid), as well as with security issues and the maintenance of public infrastructure. Consequently, the percentage share of the revenue being devoted to higher education is bound to diminish.

(b) The private sector is less and less ready to transfer funds to universities without getting a service in return or without being able to influence their activities.

(c) The cost of providing university education and of conducting research continues to grow significantly more than increases in the cost of living.

3.7.3. Economic benefits of funding higher education

Knowledge in public policy can be understood from a range of perspectives, for example, the nature of the reasoning that is applied (economic reasoning which deals with scarcity/ social reasoning which deals with distributive issues/legal reasoning which deals with the application of rules) (Adams, 2004:30). Knowledge is often perceived as a "*public good*"[25] which is re-useable with no loss of its intrinsic qualities; non exclusive (i.e. appropriable by other users); simultaneously accessible, possessed, and usable by others; and when knowledge is codified it becomes durable and transmittable at fairly low cost; but even

[25] De Villiers and Nieuwoudt (2005:2) point out that knowledge that one student acquires in the process does not mean that there is less knowledge available for the other students. In the training of students, the contact that one student makes with a lecturer (during lectures) does not decrease the time available the available time for other students.

in a codified format it is often expensive because it requires sophisticated capabilities and infrastructure to process it. Fisher (2007:38) explains that the term “public good” is used classically to refer to goods and services that exhibit two properties. The consumption of public goods is non-rival, meaning that one additional person can consume the good without reducing any other consumer’s benefit; after the good or service is produced, the marginal cost of an additional consumer is zero. (Also see Section 3.7.2.3. “Education as a positive externality”).

Secondly, knowledge is a public good (except patents) and is often also said to be non-excludable, meaning that it is not possible (at least at reasonable cost) to exclude consumers who do not pay the price from consuming the good or service. It is from this point of view that Foray (2004:91) explains that knowledge is a non-excludable good; in other words, it is difficult to make it exclusive or to control it privately. It is a fluid and portable good. Hernes (2006:46) adds an international dimension when stating that knowledge is the most international of commodities, in many respects it is an international public good. In acknowledging knowledge as a public good, governments throughout the world finance knowledge production through subsidising higher education. Steyn and De Villiers (2006:9) write that the belief in South Africa that higher education is a basic right assumes that education is a public good. This, linked with Article 29 of the *Constitution of the Republic of South Africa 1996*, can create the belief that education should be primarily publicly funded.

Governments fund higher education for a number of reasons, of which one is the economic benefit; and it accrues as a result (Harboe-Ree, 2003; Martins *et al.*, 1996). Moreover, in analysing Cemmell’s (2003) article, De Villiers and Nieuwoudt (2005:2) posit that fundamental research and research results forms the basis for future and applied

research. They conclude that if government makes no contribution to this research, it might not be undertaken at all.

Governments are constantly searching for evidence that they are receiving high returns on their investment in education, i.e. the social rate of return on investment. Power (2005:329) adds that performance funding, increased accountability and transparency forms part of "*the new managerialism*"[26] or New Public Management (NPM). As a developing country, South Africa is not behind with such reforms. The restructuring of higher education system experienced since 1997 together with the changing of the funding formula as implemented in 2001 bear testimony to such demands (Le Grange, 2003; Madue, 2006, 2007; Mubangizi, 2005; Steyn, 2002; Steyn and Vermeulen, 1998). I wish to stress that the concept of the New Public Management is also applicable in South Africa although it is highly practiced in Australia, Germany Switzerland and the Netherlands. (See Section 1.2. "Scholarly context").

Literature in the economics of higher education is substantial. However, the tendency of such literature is to focus on the costs and returns to higher education, mostly concentrating on areas of funding systems and their effects on student participation and equity aspects (Abbott and Doucouliagos, 2003; Barr, 2004; Barr and Crawford, 1998; Garcia-Penalosa and Walde, 2000; Gary-Bobo and Trannoy, 2004; Greenaway and Hayes, 2004; Kemnitz, 2004; Rolfe, 2003; Wolpe and Barends, 1993). Cohn, Rhine and Santos (2005) write that economists have recognised for some time the multi-dimensional nature of higher education. With some notable exceptions, however, cost and production analyses concerning higher education institutions have been almost

[26] Adams (2004:31) refers to this term as "economic rationalism". In a short story of knowledge, Adams is of the opinion that by the 1950s, expert knowledge, based on a rationalist faith in science and "getting down to the facts", was beginning to dominate public administration and the new "policy sciences" emerged to define and apply the laws of social science to public policy issues. Technical and legal knowledge according to Adams slid into the background with functional knowledge (e.g. about Keynesian economics) and management knowledge (e.g. planning and budgeting systems) coming to the fore.

universally uni-dimensional, ignoring or assuming away the multiple-product nature of HEIs. In comparison, relatively little attention has been paid to the link between university research funding and its influence on knowledge production, more especially from the South African perspective.

The extent to which governments give priority to education is widely determined by aggregating public expenditure as a percentage of GDP, and public expenditure on education as a percentage of total public expenditure. From a South African perspective, Steyn (2002:254), in his analysis of expenditure of the state on education (EE) specifically on higher education, cited a decreasing trend from 12% of the education budget in 1987/8 to about 9% in the mid 1990s, although a marginal increase was stated as 10% in 2001/2. Pouris (2007:1) reports that in 2001, Higher Education Research and Development (HERD) was estimated from financial and administrative records of universities and other sources of extramural research. HERD was then R1.896 million or 0.19% of GDP. Authors including Guena, (2001); Guena and Nesta, (2003); and Nelson, (2001) have expressed their worry that industrial funding will force universities into taking on ever more applied research and development work, thus leading them to neglect their responsibilities for long-term knowledge development. Florida and Cohen (1999) has referred to this situation as the “skewing problem”.

Government funding affords individuals and organisations the means to participate in the world-wide community of research and technological development (Salter and Martin, 2001:523). It was earlier argued (in page 99 of this thesis) that knowledge is also perceived as a public good that benefits both individuals who directly participate in its production and the public or society that uses the end products of knowledge. (Also see Section 3.7.4. “Social rates of return (benefits of education)”). In Australia, according to Harboe-Ree (2003:1), the Australian government

has identified research as one of its strategic policy priorities in order to improve Australia's competitiveness. Nutley, Walter and Davies (2007:37) stress that among policy makers in particular, research use may be strategic or tactical. Research can be used as an instrument of persuasion, to support an existing political stance or to challenge the positions of others. It can be used to legitimate a decision or a course of action.

Governments across the world invest heavily in research and research infrastructure through recurrent funding and grants. With government funding, new economically useful information is created and the distribution of this information enhanced through the tradition of public disclosure in science (Salter and Martin, 2001:511). Yet, the economic benefits of such networks are difficult to measure. Many of the problems in assessing the benefits of publicly funded basic research stem from limitations of models used to evaluate those benefits (*ibid*.). Smith (1999:173) arrived at the same conclusion as he states:

> *There is a clear link between being a graduate and having improved earning capacity, but there is no rigorously proven causal link between the numbers of graduates a country produces and its economic prosperity. So long as this holds, there will be increasing emphasis on the learner paying a significant proportion of the costs of higher education. And as the learner has to pay more, this will in turn increase market forces and make the traditional type of university more responsive to the needs of society, especially as other competing agencies enter the higher education market.*

Research suggests that university graduates enhance creativity through their critical approach, stimulate others, and bring new innovative approaches to increase productivity. Salter and Martin (2001:522) explain that new graduates entering industry bring not only knowledge of

recent scientific research but also an ability to solve complex problems, perform research and develop ideas. The skills developed during their education with advanced instrumentation and techniques may be especially valuable. Moreover, the skills acquired during education are often a necessary precursor to the development of industry-specific skills and knowledge (*ibid*.). According to Hall (2006:03), an individual derives private benefits – represented by increased lifetime earnings and higher social status – as a result of a university education. At the same time, there is a public benefit through raising the skills level of the workforce, contributing to economic growth and greater competitiveness.

Without adequate higher education and research institutions providing a critical mass of skilled and educated people, no country can ensure genuine endogenous or sustainable development and, in particular, developing countries and the least developed countries cannot reduce the gap separating them from industrially developed ones (Hernes, 2006:46). Governments around the world are recruiting university graduates to contribute in their economies. In South Africa, for example, graduates are increasingly absorbed in the public service to speed up the delivery of services to the public.

In the more elite universities, research has played a major role in defining their brand and is increasingly becoming a driver to produce an institution without walls, more receptive to the needs of industry and government (McManus, 2007:3). Again, in the recruitment of graduates, the brand or rather the reputation of the university also plays a vital role in the selection process prospective employees. Some university graduates are more preferred than others using the reputation of the universities as a criterion. Certain universities are viewed as research oriented while others are viewed as teaching oriented.

The mixture of education and research is highly defensible as Kerr (2003) has pointed out. He stated that it has been estimated that over the last thirty years, nearly half of the national growth can be explained by the greater education of the people and by better technology, which is also largely a product of the education system. It is against this background that my research seeks to study the effect of the research component of the South African higher education subsidy formula on knowledge production.

Higher education does not only benefit individuals who pass through the system but it also benefits policy-makers and the society at large. Moreover, Stevens and Weale (2004:167) argue that because education delivers economic benefits to individuals, we should expect to see effects of education on groupings of individuals (nations). The benefits in this regard, are referred to as social benefits. Governments are continuing to invest in higher education by means of subsidies, with the aim of yielding returns on their investments. It is often argued that the benefits of higher education do not only accrue to the person going through higher education, but to the society at large.

3.7.4. Social rates of return (benefits of education)

At the level of higher education, education and research can hardly be separated. Studies of the rate of return on education take two forms. Some focus on the private rates of return – i.e. the return on investments in education that flows from an individual research project to the organisation. Others examine the social rate of return to education – that is, on "the benefits which accrue to the society" (Salter and Martin, 2001:514). For example, one of Barr's (2004:268) findings on higher education funding is that there are strong quantitative arguments that higher education creates benefits to society above those to the individual – benefits in terms of growth, social cohesion and the transmission of

values. The findings suggest that taxpayer subsidies to higher education should be a permanent part of the landscape.

Society gains according to Bloom and Sevilla (2003) from a person's higher education if the total social benefits from this education are larger than the total social costs of producing it. McMahon (2004:243) shares the same view when he explains that, unlike private rates of return, the social rates of return reflect the full investment costs. These costs according to McMahon, are not just those an individual and his or her family, including their forgone earnings costs, but also those to the society in the form of institutional costs and grants. In this context, De Villiers and Nieuwoudt (2005) view society gains as indirect benefits of education. Indirect benefits include among others; better communication, increased responsible behaviour, law abiding behaviour and better understanding of the democratic process. Society's gain can be measured by the net social benefit, or the excess of social benefits over social costs.

Bloom and Sevilla (2003) explain that social benefits include the private benefits enjoyed directly by the individual, such as higher earnings through life. But they also include public benefits, that is, benefits that society derives from higher education over and above those enjoyed by the individual himself or herself. These include among others:

a) A critical mass of well-informed citizens who understand and work for democratic practice;
b) A larger pool of capable business people who can run more efficient businesses and ultimately expand the economic pie;
c) Political leaders who can understand the confluence of local conditions and fast-evolving international arena; and
d) Scientists and technicians who can play key roles in appropriately adapting and integrating developed-world

practices into a society's agricultural, industrial, and educational systems.

However, Barr (2004:268) acknowledges that quantifying the social benefits of higher education entails a series of difficulties, not least because it is hard to separate the effects of education from other determinants of a person's productivity. This situation is known as the screening hypothesis. The screening hypothesis argues, first, that education beyond a basic level does not increase individual productivity and, second, that firms seek high-ability workers but are unable, prior to employing them, to distinguish them from those with low ability.

According to the screening hypothesis, post-primary education fills exactly that function: it gives a signal to prospective employees. Just as an individual's good health may be due more to a strong constitution than to medical care, so, according to this view, is productivity the result of natural ability rather than post-primary education (*ibid*:269). Bloom and Sevilla (2003:1) contend that while estimates of the relative size of these costs and benefits are hard to come by, it is not unreasonable to assume that in many cases, the benefits are larger that the costs, so that on the whole, there are net social benefits to investments in higher education.

According to De Villiers and Steyn (2007:4), the high private rate of return is a good argument for an increase in the private fees of education, but the high social rates of return also indicate that investment in education is a profitable investment for the rate. This means that an argument can be made in favour of increased public expenditure on education. The social benefits of education serve as a precursor for education as a positive externality.

3.7.5. Education as a positive externality

An externality exists if one economic agent's action (consumption or production) affects another agent's welfare outside of changes in market prices or quantities (Fisher, 2007:36). This statement implies that externalities can be negative or positive. Education as a public good also yields some externalities. However, this section only concentrates on the positive aspect of education as an externality as will be illustrated later on. below. Bloom and Sevilla (2004:141) argue that a strong efficiency reason for the state to bear some of the costs of higher education is the existence of positive externalities. One possible positive externality provided by education is that it serves as a powerful force of socialisation (Rosen and Gayer, 2008:135). And in democratic governments, education gives voters background and perspective on which to base their political choices (*ibid*.). This view suggests that education assists in building an informed society more especially in democratic governments where the citizenry influences government decisions.

Universities are constantly adjusting their programmes to address the needs of the society. Harkins and Kubik (2006:103) agree by stating that universities strive to develop knowledge that can add value to successful companies and organisations. Redefining and rebuilding the missions of universities to equip students with the skills and knowledge required by the modern global economy means taking advantage of diverse thinking and new interdisciplinary curricula (*ibid*.). In this sense, higher education benefits go beyond the individual students and yields fruit for companies, organisations and the society at large, hence the benefits are referred to as "positive externalities".[27]

[27] Hall (2006:165) explains that positive externalities occur when an external benefit is generated by the producer of a good but because there is no market for the externality the producer cannot get compensated for producing this extra benefit.

Salter and Martin (2001:522) enlighten us that many studies of the economic benefits of publicly funded research identify skilled graduates as the primary benefit that flows to firms. MacMahon (2004:211) explains that educational externalities are over and above the private benefits that the individual decision maker takes into account in making his or her private decision to invest in education. They include education's impacts on economic development goals that are part of the quality of life but also benefit future generations.

Education externalities are social or public benefits from the education of each individual that benefit others in the society in both current and future generations (McMahon, 2004:211). In his analysis of externalities and education, Hillman (2003:633) writes that knowledge and education are also foundations for economic growth through externalities over time; better teachers make better students, who make better teachers, and so on, which expands the knowledge base of society. Positive externalities from education address education's effects on members of a society rather than students. Moreover, education externalities can assume various forms. However, externalities can broadly be classified into the two major categories of stability externalities and economic growth externalities (Fisher, 2007; Hall, 2006; Mueller, 2007).

In terms of stability externalities, Hall (2006:166) holds that education increases civic engagement and thereby contributes to a stable and democratic society. Mueller (2007:8) subscribes to this scholarship when arguing that educated people are supposed to benefit others by having a lower probability of performing criminal activities and by making more informed political decisions. Both effects presumably contribute to the stability of a society (*ibid*.). In supporting the notion of economic growth externalities, Hall (2006:168) argues that education increases not only the productivity of the person being educated but also the productivity of

his co-workers. He further cites Hanushek (2002:2065) in which he summarises this perspective thus:

> *If a highly skilled workforce permits entirely different kinds of technologies to be introduced, or to be introduced earlier in a development cycle, expanded education of an individual may indeed affect other workers in the economy. Or, if improved abilities of the best students lead to more rapid invention and development of new technologies, spillovers[28] of educational investment may result.*

Hall (2006) concludes his argument by stating that the spillover benefits create a justification for government intervention in education only when a person cannot be compensated for generating these external benefits. Mueller (2007:9) is of the opinion that educated individuals drive the growth in the economy. Accumulating evidence suggests that a highly qualified workforce contributes substantially to a nation's economic competitiveness, particularly when a large share of the workforce has acquired knowledge through higher education. Paganetto and Scandizzo (2003:90)[29] write that the sectors that can exploit the dynamic linkage between the accumulation of knowledge and ordinary production will find themselves experiencing economies of scale. The command of knowledge has become the key success factor. These findings apply to both industrialised and developing countries; those countries that improve opportunities for education and training beyond school enhance the employment prospects and the competitiveness of their overall workforce (Tierney, 2006).

[28] While most of the authors use the term "education externalities" Hanushek (2002) and Hall (2006) use the term "'spillovers" instead. Therefore, in this thesis the two terms are used interchangeably since they are assumed to be sharing the same meaning.

[29] Paganetto and Scandizzo (2003) have examined the work of Kenneth Arrow (1962) who wrote an article 'The economic implications of learning by doing' and that of Eytan Sheshinski (1966) who developed the idea of learning economies and its implication for comparative advantage.

Literature that empirically investigates the role of education in the process of economic growth is quiet substantial. Such literature takes the form of growth accounting as in the works of Hall and Jones (1999); Greenaway and Haynes (2004); McMahon (2004); Rauch (1993); Young (1995); or growth regressions (Acemoglu and Angrist, 2000; Benhabib and Spiegel, 1994; Pritchett, 2001). A deduction can thus be made that the social rate of return for investing in education can be accounted for or calculated.[30] According to Vossensteyn (2004:41) the social rate of return for higher education can be calculated based on the monetary external effects, such as economic growth and increased tax payments from graduates.

Recent studies show that the social rates of return are substantial in developed countries, ranging from between 6% and 15% (Blöndal, Field and Girouard, 2002). Positive externalities of education are not only prevalent in the developed countries, but in all developing countries across the globe. Table 3.1 presents a summary of the positive externalities, as adopted from Vossensteyn (2004).

[30] Psacharopoulos' (1994) article entitled "Returns to education: a global perspective" contribute to our enlightenment as it provides an international survey of rates of return to education. Psacharopoulos and Patriachos (2004) have extensively studied human capital and rates of return. Among others, they have calculated the rates of return in terms of narrow versus wide social rate of return, private rate of return, social rate of return and the macro approach to rates of return. Also see Stevens and Weale (2004) who concentrated on education and economic growth, with special emphasis on returns to education. With a concentration on the developed countries, Blöndal, Field, and Girouard (2002) elaborated on Investment in human capital through upper-secondary and tertiary education.

Table 3.1. Positive externalities of Higher Education

The Private and Social Costs and Benefits of Higher Education		
	Private	**Social**
Costs	• Tuition, fees and study material • Forgone earnings	• Operating costs of programmes • Student support • Foregone national production related to students
Monetary Benefits	• Higher productivity and thus higher earnings • Better job opportunities • Higher savings • Personal and professional mobility	• Higher national productivity • Higher tax returns • Greater flexibility in labour force • Higher consumption • Less dependency on government
Non-monetary benefits	• Educational enrichment • Better labour conditions • Higher personal status • Higher job satisfaction • Better health and life expectancies • Improved spending decisions • More hobbies and value of leisure activities • Personal development	• Social cohesion, appreciation of social diversity and cultural heritage • Higher social mobility • Lower crimes rates • More donations and charity work • Increased capacity to adapt to new technologies • Higher social/ political participation

Source: Vossensteyn, 2004

Table 3.1. highlights substantial financial and non-financial benefits of higher education for both the students and the society at large. Rates of return analyses provide a baseline estimate of pure economic value of education, including not only the monetary costs and benefits of education (Dolton, Greenaway and Vignoles, 1997:712). The high social rates of return according to de Villiers and Nieuwoudt (2005) also indicate that investment in education is a profitable investment for the state. This means that an argument can be made in favour of increased public expenditure in education. In complementing Table 3.1., education as a positive externality can be expressed as illustrated in Figure 3.2. below.

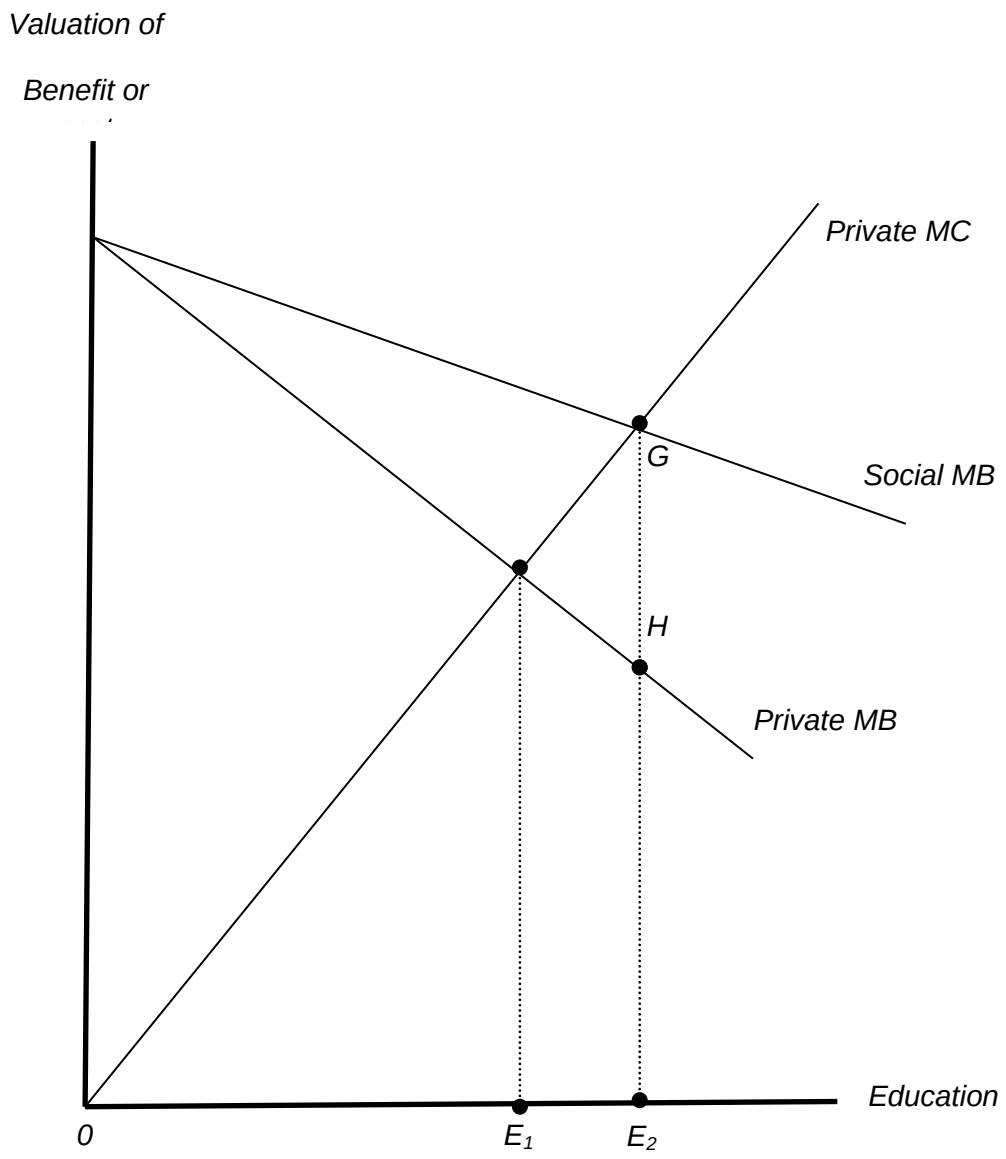


Figure 3.2. Education as a positive externality

Source: Hillman (2003:265)

In Figure 3.2., Hillman (2003) illustrates a positive externality associated with an individual's education. In this case, the externality is expressed as the difference between private and social *MB*.[31] The source of the externality may be the benefit from interacting and working together with better-informed people (*ibid*.). When schooling provides the quality of education or period of education indicated by (E_2 – E_1) is not

[31] *MB* is the sum of marginal benefits (demand) to a population from a public good. MC shows the marginal costs (supply) of inputs used for supply of the public good. G represents the quantity of the public good.

compulsory, a subsidy from government of *GH* (equal to the difference between social and private *MB* at E_2) increases the quality of education or the number of years from E_1 to E_2. The subsidy resolves the externality problem by ensuring that social benefits of education are precisely internalized in personal education decisions.

Education as positive externality can be viewed as direct and indirect. For example, De Villiers and Nieuwoudt (2005:4) are of the opinion that direct benefits refer to the higher earnings that highly skilled workers normally receive, the fact that education makes them more productive and qualify them for more profitable occupations. Indirect benefits come in the form of more study opportunities that are available to highly skilled people, a greater variety of occupations that can be chosen from, greater flexibility to adapt to a changing environment, it broadens people's frame of mind and makes it possible to lead a fuller life.

However, Vossensteyn (2004:40) argues that the major difficulty is measuring precisely the extent of the benefits. Not all can be measured according to a single scale, if they can be measured at all (*ibid.*). Vossenteyn echoes the words of Albert Einstein who asserts that "*Not everything that can be counted counts and not everything that counts can be counted*".[32] Salter and Martin (2001:511) conclude that the main product from government-funded knowledge production (in other words, research) is thus seen to be economically useful information, freely available to all firms. In this context, they argue that, scientific knowledge is seen as a public good.

According to Hillman (2003:63), the identifying aspect of a public good is not whether it is paid for privately or publicly financed, but whether one person or a number of people benefit. Only one person or firm at a time

[32] Many authors such as Vossensteyn (2004) and Callahan (2004:31) cite Albert Einstein on the subject of performance measurement.

benefits from a private good. The benefit from a public good is collective, to a number of people (*ibid*.). The developments in education externalities have paved the way for introducing literature on higher education frameworks.

3.8. Higher education funding frameworks

Public service reforms across the world have been advocated on the premise that it (the public service) has been too big and had been organised on outdated principles and therefore is in need of reinvention, institutional renewal and the application of market mechanisms (Parker *et al*., 1997; Tjeldvoll, 1998). This situation has led to the development of policies of restraint on public spending, the privatisation of state assets, the adoption of market models and corporate governance for the procurement of public goods and services.

Since 1994, administrative reforms in South Africa picked up a higher pace than the period just before the first democratic elections that took place in 1994. A number of policies were enacted with the aim of transforming the public service. The transformation agenda[33] in South Africa sought to create a single coordinated higher education system through the *Higher Education Act (Act No.101 of 1997).* Moreover, Price (2007:29) stresses that nationally the project of transformation has dominated the strategic agendas of most South African universities since the early 1990s. As a result, in recent years South Africa has seen dramatic changes in the higher education sector.

Lues (2005:91) points that the *Higher Education Act of 1997* bestowed the Minister of Education with the legal powers to carry out higher

[33] Transformation in higher education involves a process of new knowledge production, reflective action, which means seeing new problems and imagining new ways of approaching old problems and, deconstruction and reconstruction or constant exploring beneath surface appearances "to respond to a future that cannot be imagined" (Waghid, 2002:459).

education restructuring (establish, declare, merge and close public higher education institutions (HEIs). The following sections of the *Higher Education Act of 1997* provides for the powers of the Minister of Education:

- Section 20(1) stipulates that the Minister may, after consulting the CHE, by notice in the Gazette and from money appropriated for this purpose by Parliament, establish a university, technikon or college.

- Section 21(1) states that the Minister may, after consulting the CHE and by notice in the Gazette, declare any institution providing higher education as –

  (a) a university, technikon or college; or
  (b) a subdivision of a university, technikon or college.

- Section 23(1) stipulates that subject to subsection (2), the Minister may, after consulting the CHE and by notice in the Gazette, merge two or more public higher education institutions into a single large public higher education institution.

Reforms in higher education appear to be a worldwide phenomenon. For example, in the United Kingdom, Stiles (2002:711) reports that the 1992 *Further and Higher Education Act* resulted in a more devolved higher education system and the conversion of polytechnics and other institutions into “post- 1992” universities. Parker *et al*., (1997) reported earlier that in the last two decades there has been major transformations in terms of amalgamations of institutions into larger units, renaming of Colleges of Advance Education (Australia) and Polytechnics (UK) as “new universities”, changing the disciplinary mix within the sector, moves towards fee paying for undergraduate and postgraduate courses, increasing selectivity and concentration of research activities, and the changing nature of the international working environment.

Abbot and Doucouliagos (2003:89) also report that the Australian government has attempted this, primarily, by trying to achieve greater economies of size and scope by consolidating higher education institutions into a smaller number of very large, multi-campus universities. From the Norwegian experience, Welle-Strand (2000:225) states that prior to the reform of higher education in 1994, the university sector in Norway consisted of four universities and 98 university colleges. However, in 1994, the former regional and vocational colleges were reorganised and merged into 26 larger units, with the government's aim being to make better use of the available resources and raise academic standards.

In comparison, South Africa's *Higher Education Act of 1997* also resulted in the renaming of former technikons into universities of technology. This process prompted the formulation of numerous policies to point the higher education sector towards a new and more effective mode of functioning, knowing that national growth and competitiveness are dependent on continuous technological improvements through research and development (Bunting, 2002; Maassen and Cloete, 2002; Chetty, 2003; Council on Higher Education, 2004; Department of Education, 1997).

The higher education framework in South Africa, according to Kraak (2000:110), borrows heavily from international models of financing, quality assurance and national qualifications mainly from the UK, Australia and New Zealand. Krause (2007:1) reports that Australian higher education has also witnessed its fair share of policy changes in the recent past. He cites three broad policy changes as: the establishment of the national Learning and Teaching Performance Fund, the introduction of the Research Quality Framework, and the growing interest in knowledge transfer and community engagement.

According to Burke (1998:56) state policies for higher education reflect, consciously or unconsciously, the core values of efficiency, quality, equity and choice. Hobson *et al*., (2005:358) argue that allied to massification of the higher education sector has been significant change to university funding mechanisms, to research funding and to higher research degree training. The system of funding higher education has undergone a series of gradual but significant changes in recent years, which have encompassed the systems both of central funding for universities and of financial support for individual students.

Changes in funding have been introduced alongside a number of structural changes which have influenced university operations (Rolfe, 2003:24). In South Africa, the 1997 WP3 cited imminence of the new public higher education funding formulas.[34] In response to the WP3, the Ministry of Education proposed the NFF to which it had invited comments. This was necessary as the funding framework introduced in 1982-1983 was not suitable. Apart from its origin in the apartheid past, it could not be used as a steering mechanism to address national goals and objectives (Madue, 2006:14).

The funding formula, the lens through which state officials evaluate fiscal issues in higher education, is at the centre of state higher education policy discussions (Deaton, 2004:3). From the United Kingdom's perspective, Stiles (2002:712) enlightens us that all inherited funding methods were designed to operate under a tight financial public expenditure regime that had been in existence since the early 1980s. From the South African perspective, Steyn (2002:253) reports that according to the WP3, the SAPSE subsidy formula – used since the early 1980s for funding universities had many limitations and had to be replaced by a funding framework which is envisaged to increase equity in access and outcomes, improve quality and efficiency, and to link higher

[34] Funding formulas were operationally defined by Marks and Caruthers (1999:5) as a system that "links resources mathematically to an institution's characteristics".

education activities and national and regional needs more purposely. The Ministry of Education (2006:2) emphasises that planning, funding and quality assurance are the three mechanisms used to steer the South African higher education system towards the goals set out in the WP3 on higher education transformation.

A fair amount of South African authors have written on the higher education funding framework (Akor and Roux, 2006; Blankley and Kahn, 2005; Bunting, 2002; Cloete and Bunting, 2000; De Villiers and Nieuwoudt, 2005; De Villiers and Steyn, 2007; Madue, 2006, 2007; Mubangizi, 2005; Melck, 1982; Steyn, 2002; Steyn and Vermeulen, 1998; Stumpf, 2001). To start with, Blankley and Kahn (2005) are concerned with the history of research and experimental development measurement. Although Melck (1982) studied the methods of financing universities with special reference to formula funding in South Africa, he focuses on three reasons why the government should be involved in education, namely risk taking, uncertainty and insufficient liquidity.

The focus of South African authors varies considerably. For example, Steyn and Vermeulen (1998) gave an exposition of the evolution of SAPSE formulas since 1951, while Madue (2006) concentrated on how one South African higher education institution and its faculties respond to the new policy of the measurement of research output, and (2007) addresses the New Public Management and the implementation of the polices on the measurement of research output. In the economics of higher education, De Villiers and Nieuwoudt (2005) highlight the shifting trends in higher education funding. In line with De Villiers and Nieuwoudt's study, the focus of my study is to add to the empirical literature on higher education funding by means of tracing and elaborating on the trends in South African higher education research output, particularly in the six year period of 2001 to 2006.

Cloete and Bunting (2000) and Bunting (2002) concentrate on the state of higher education funding in response to higher education transformation. Stumpf (2001) sheds some light on the implications for the reconfiguration of higher education, whereas Mubangizi (2005) is focusing on legal issues and implications of government funding of universities in the new South Africa.

While literature in this area characterises the organisational and epistemological features of higher education funding, current policy discourses contribute little in helping scholars and policy makers in understanding the effect that the research component of the current funding framework has or might have on knowledge production. Policy debates are relatively silent on the relationship between the new higher funding framework and its possible effects on knowledge production. To date, no empirical study has been recorded on the effect that the research component of the higher education subsidy formula has on knowledge production.

Arguably, the closest study to this thesis is that of Akor and Roux (2006) in which they are focusing on the state of higher education transformation, with special emphasis on the policy implications for institutional autonomy and academic freedom. In terms of close proximity, Cloete and Bunting (2000) come second as their concentration is on higher education funding in relation with equity and redress. Moreover, Hobson *et al*., (2005:358) stresses that funding of universities has shifted from an embedded “block” grant allocation to a performance-based funding model with research outputs being a key performance measure. It should be noted that the current funding formula still contains the block grants. However, its emphasis is on the performance of higher education institutions in terms of their research output.

The third closest study is that of Jinabhai (2003) in which he studied research as a performance indicator in higher education. Jinabhai (2003:55) is of the opinion that research forms a fundamental component of the higher education system, as a significant performance indicator. The funding for this category is of principal concern to the higher education sector, especially since the subsidies allocated in earlier years, which were based in part on “blind research funding”, have fallen away and have become output-driven. Jinabhai confirms Stumpf’s (2001:4) findings in which he reports that:

> *The recently developed and implemented subsidy formula for higher education focuses on the number of graduates and publications. In the case of the latter, journal articles as opposed to book publications, are emphasised. This output-oriented model means that the state will no longer simply allocate funding based on the intake of students, but also on graduate outputs with students at higher levels, for example, PhD and within various disciplines such as science and engineering gaining greater levels of funding. The implication for academics is that they have to increase their productivity levels.*

In considering the importance of increasing the research productivity levels of academics, it is therefore, necessary to understand the methodologies and the historical background of measuring research and knowledge production.

3.9. Methodologies and history of measuring knowledge production

In his reflection on university research funding, Birnbaum (2002:49) writes that during the past 40 years, the nature of funding for university research has changed significantly. At the same time the nature of university research and attitudes within the research community have evolved. The

changes have occurred gradually, and for this reason, many of them have gone unnoticed. Measuring research output and impact has a relatively long history. The most common approach is bibliometrics, a research method using quantitative analysis to measure research output and impact within or between a given field or discipline (Macauley, Evans, Pearson and Tregenza, 2005:190).

A distinction can be made between two contexts of use of bibliometric data or indicators in the study of scholarly activity; *a scholarly research context, and a policy context* (Moed, 2005:14). Bibliometric indicators in *a scholarly research context* are used as tools in testing hypotheses or examining universal relationships among variables within a theoretical framework. It is the validity of a particular hypothesis that is at stake. In *a* policy context, bibliometric indicators may be used in reaching some type of policy decision. This decision may relate to an individual, but also to aggregates of individuals such as research groups, institutes or disciplines (*ibid*.).

Although Van Raan (2004:2) reveals that scientists have communicated (and codified) their findings in a relatively orderly, well defined way since the 17th Century, Moed *et al.,* (2004:26) concede that bibliometrics is known to have been used as early as 1917 but it gained popularity after the introduction of the *Science Citation Index* in 1961. As a bibliometrics method, Hu (2007:389) enlightens us that the citation index has become an important tool for estimating the impact of scholarly work since it was proposed by Eugene Garfield in 1955. In terms of measuring overall national research and development, Pouris (2007:2) is of the opinion that possibly J.D. Bernal, FRS, the distinguished crystallographer, historian of science and internationalist was the first in modern times to attempt an overall national measurement of research and development. Bernal's first publication appeared in *The Social Function of Science* in 1939 (*ibid.*).

The international history of the measurement of science and technology, that is, knowledge production, dates back more than 50 years, with its origins in the National Science Foundation of the United States in the 1950s and the Organisation for Economic Cooperation and Development (OECD) in the 1960s. The first edition of the *Frascati* Manual was published in 1963 and stimulated the process of institutionalising R&D surveys through its guidelines, definitions and methodological recommendations (Blankley and Kahn, 2005:151). South Africa, for its part, conducted its first R&D survey based on the OECD guidelines in 1966, and over the next 25 years conducted 18 regular official surveys, mostly on a biennial basis, but sometimes annually (*ibid*.). However, Diamond and Graham (2000) argue that the history of reputational surveys as the mainstay of national university comparisons since the 1920s shows remarkably little research validating its utility as an accurate measure of research quality.

Knowledge or rather scientific productivity is one of the favourite debates of science researchers, especially *scientometricians* and *bibliometricians*. According to Moed (2005:31) bibliometric investigators empirically analyse and further operationalise the various manifestations of scholarly performance and examine their interrelationships. Moreover, they conduct empirical studies of the conditions under which research activities are carried out and identified from a physical, economic, sociological, historical or communication-scientific perspective and indicate various types of factors that may enhance or hamper scholarly performance.

Although several studies have according to Dundar and Lewis (1998) attempted to examine the institutional factors that contribute to research productivity, many have perceived that measuring research performance is a relatively easy task because of readily available measures such as published books, journal articles, or citation counts across universities. In recent years, efforts to evaluate and assess research activity have

increased, citation data and journal impact factor have been widely used as indicators of the “scientific achievement” of corporations, institutions and departments, as well as individuals, for purposes such as university ranking, faculty evaluation and promotion decisions. However, in most of the above situations, diversity between different disciplines or fields is ignored, using only the absolute number of citations or citations per paper as criteria of one’s research level. Thus, controversies over citation indicators have become widespread (Hu, 2007:390).

Bibliometrics tend to rely on citation analysis as an indicator of research productivity and quality for articles appearing in ISI listed journals. ISI limits its indexing primarily to journals, thus reducing its relevance to fields for which journals are preferred research dissemination method; journals are favoured by disciplines in the natural sciences, and books or monographs by some social sciences (Braxton and Hargens, 1996; Diamond and Graham, 2000; Lorden and Martin, 2000; Madue, 2006). Yet, citation analysis is but a single indicator, and no single indicator can solely be used in sufficiently measuring the complexity and quality of institutional knowledge production. Diamond and Graham (2000) recommends that an indicator documenting book publication would be appropriate for assessing humanities, who have limited engagement in journal publications.

The measurements and evaluations of individual and departmental research accomplishments are often based at least in part on the number of publications produced over a specific time period. Interestingly, studies that address institutional-level productivity often base their analysis solely on teaching activities, and thus overlook the research activities of an institution (Toutkoushian *et al*., 2002:3). Many analysts have argued that at the higher education level, the teaching and research functions are synergetic. Each informs the other and in particular an active presence in

the research milieu assists to improve the quality of teaching (Whiston, 1994:163).

Globally, Toutkoushian and Danielson (2002:48) point out that “the goal of advancement of knowledge through research is especially underrepresented among the sets of indicators that are used in higher education”. Information on the research output of institutions has not been readily available to those interested in assessing and comparing institutions. According to Toutkoushian *et al*., (2002:4) the lack of attention given to research accomplishments is troubling because the resulting assessments and rankings of institutions will overlook an important facet of their mission. This situation is perpetuated by the absence of universal measures and indicators of research productivity.

The most commonly used measure of individual and departmental research productivity is the number of publications in selected outlets such as academic journals (Creamer, 1998; Dundar and Lewis, 1998; Fox, 1992; Johnes and Johnes, 1993; 1995; Johnes and Taylor, 1991; Parker *et al*., 1997; Porter and Umbach, 2001; Toutkoushian *et al*., 1998) or counts of conference papers, accredited journals publications and books (Bellas and Toutkoushian, 1999; Buchmueller *et al*., 1999; Noser, Manakyan, and Tanner, 1996; Perry *et al*., 2000). However, it should be noted that journal articles are not the main carrier of scientific knowledge in all fields.

According to Moed *et al.,* (2004:26) journals are not “equivalent” elements in the scientific process, they differ widely in importance; and they are challenged as the “*gold standard*” by new types of publication behaviour, particularly electronic publishing. Also relevant, particularly in departments in which a significant portion of the work is practical and applied, are patents and licenses. Therefore, a combination of various methods is necessary to assess quality and quantity of output production.

De Groot, McMahom, and Volkwein (1991) in their study of American institutions conveniently incorporated bibliometrics and peer review to measure research output, while Johnes and Taylor (1991) measure research output by using both publications and citation analysis and research income. Birnbaum (2002:53) cautions that, universities need to make a serious effort to substitute quality for quantity in evaluating publications for promotion and tenure.

In terms of the South African funding framework, Steyn (2002) concentrated on the state funding of universities and technikons from 1993 to 2001. His emphasis was on analysing student growth and subsidy allocations to universities and technikons under SAPSE formula that has been used by the state for almost 20 years to fund universities and technikons. Although I will also be drawing data from the same era, my focus is on the reporting years 2002 to 2007. That is, the data for this study is mostly drawn from 2001 to 2006.

The focus of this thesis is on the research component of the higher education funding subsidy that is based on the NFF, seeking to establish the effect that it has had on knowledge production. (See Section 1.7. "Unit of analysis and units of observation"). Lues (2005:93) points that national research output as a first concern of the Ministry of Education has shown a decline in published outputs in HEIs in recent years. This decline questions the ability of the higher education system to meet the research and development needs of the country. What is especially distressing is the decline in basic research, including research in the humanities.

Research knowledge needs to be suitably conveyed to others working on the same immediate problem – and to a wider circle of colleagues working on related problems - and beyond, to those who may gain usable knowledge for different applications from the findings (Porter *et al*., 2007:118). In South Africa, the DoE (1997(a)) states that, the research

output of a university comprises of original research papers, research letters and review articles which appear in approved journals, as well as books for the specialist and patents that comply with the DoE criteria.

In complementing the DoE policy, Ashworth and Harvey (1994:110) indicates that publications, which are clear evidence of research activity, are usually taken to include, in order of their importance, publications in academic journals, professional journals, books, reports, edited works and proceedings. According to the new research funding formula, the weightings for research outputs are calculated at one credit for either a publication unit or a completed masters, shifting an important focus to the publication of articles in accredited journals (Ministry of Education, 2004) (The reader will notice in Chapter 5, that I do not include masters degrees in calculating knowledge production). Lues (2005:100) concludes that research output, fortunately, relates to more than rand-and-cents value – it expands visions, empowers, and adds to the gaining of knowledge.

In the above literature review, particularly in the South African context, concentration has been on the importance of publishing in scientific journals as well as the visibility of South African journals in the international arena (Effendi and Hamber, 1999; Glänzel and Moed, 2002; Le Grange, 2003; Lues, 2005; Pouris 2003, 2004, 2006; West, 2006). Pienaar *et al*., (2001) only concentrated on South Africa's system of evaluating and rating individual researchers. For government policymakers, corporate research managers, and university administrators, the common purposes of evaluating research groups are monitoring performance relative to peers and competitors, then setting priorities for strategic planning (Hu, 2007:391).

Egger and Carpi (2009:2) argue that scientists consult the literature to learn all they can about a specific area of study, and then cite those

articles to both acknowledge the authors as the originators of idea they are discussing and also to help readers understand their line of reasoning in coming to their conclusion. The literature consulted for this thesis has highlighted the need for empirical study on the effect that the research component of the NFF has on the knowledge productivity of South African higher education institutions. For example, Brewer *et al*., (1999:374) have long argued that no published study has examined the determinants of graduate research productivity empirically; and, consequently, doctoral programmes do not have empirically-validated information on how to produce better research scholars.

This study contributes to the scholarly knowledge through providing an empirical insight into the effects that the research component of South Africa's NFF has had on the knowledge production of HEIs since 2001. This thesis postulates that a comprehensive assessment of the effects that the research component of the NFF has had on knowledge production of HEIs in South Africa will contribute towards effective decision making and strategic planning of higher education stakeholders, thereby increasing knowledge creation and innovation, that will be of benefit to the HEIs and the country in general. Various assumptions have been drawn from the literature consulted and are discussed hereafter.

3.10. Emergent assumptions

In reviewing the above literature, various assumptions made by scholars across all disciplines have emerged. For the purpose of this thesis, only five are regarded as crucial. The key assumptions of the foregoing literature review are:

a) The production of knowledge is social process, whereby the world of policy-making and the world of research and science meet and

work together in producing policy-related information, produced especially as input to the policy process;

b) Science is a social investment in the production and dissemination of knowledge that is expected to generate economic and social returns as this knowledge is commercially developed and exploited;
c) Scientific research is seen as a distinct category of public spending that requires rationalisation;
d) If science is instrumental in technological progress and ultimately economic growth and prosperity, it follows that the economic theory and standard tools of resource allocation should be applicable to science; and
e) For science to be analysed as a social instrument, scientific activities must be interpreted as the production of information and knowledge.

Lastly, from a public administration perspective, I would like to draw from Adams' (2004:31) embedded assumptions of public administration which include:

a) That departments are an efficient and effective organisational unit for the administration of democracy;
b) That functional organisation (e.g. health and education departments) is the best way to coordinate and deliver services;
c) That the public service is best placed to deliver public services (recently under challenge from markets and now from communities);
d) That outputs and outcomes are the key organising principles for allocation and accountability;
e) The idea that cause and effect between systems can be aggregated (e.g. that outputs can be aggregated to outcomes that constitute wellbeing and prosperity); and
f) That policy is created after objectives are set, not before.

Public Administration has a series of inherited knowledge assumptions which we rarely explore because they are so embedded in our ontology – they are part of the lens through which we view the world (*ibid.*). The assumptions perfectly serve as a precursor of the key findings from the literature review.

3.11. A synopsis of the key findings from the literature review

Key findings from the above literature review are, firstly; knowledge production plays a vital role in the purpose of a university; secondly, higher education seems to be the most relevant education variable to this study, particularly in developed countries; third, the government's funding of higher education contributes towards the university's increase of knowledge production; lastly, although comprehensive studies on higher education funding are registered, no studies on the effects of higher education funding policies has been documented, especially from a developing country context. The four emergent findings from the literature review are, therefore, used as tools to extent the lens with which to view the remaining chapters of this thesis.

3.12. Conclusion

Although the key findings from the literature review are highlighted in the preceding discussion, the conclusion serves to round off the entire literature review, thereby highlighting some of the important features that do not necessarily form part of the findings. Most of the literature reviewed uses terms such as "knowledge production", "scientific productivity", "research output" and "higher education funding". The review has suggested that knowledge can be defined in various ways and what is valued as knowledge changes over time. Although

knowledge production can be defined from different fields of study, I have adopted a bias towards definitions provided by Public Administration and Education scholars, in order to limit the definitions at my disposal.

The literature has revealed that not all knowledge is part of science. Facts and information on their own are not per se scientific knowledge, they are building blocks toward scientific knowledge. They are building blocks towards knowledge. Furthermore, measuring knowledge production poses significant challenges for both researchers and the government. There is no consensus on a single measure that can be applied across all scientific disciplines. Various measures such as journal publications, books, patents and published conference proceedings are commonly used.

Knowledge is often regarded as a public good and governments invest funds in the production of knowledge through funding public higher education institutions. Government funding for science and education, to the extent that it leads to publications, helps to identify relevant knowledge. Moreover, in a knowledge-based economy, higher education plays a vital role in a nation's ability to actively compete in a global economy. Governments fund scientific research or knowledge production to support the formulation and implementation of public policies and to correct for an insufficient level of private investments. When wide potential applicability and open dissemination is deemed to be very important, a possible way out is to publicly finance the production of knowledge and freely disseminate the results (this is basically what happens in academic research). Open publication is consequently an essential aspect of publicly funded research.

The important link between university funding and knowledge production (as universities are particularly subsidised by public funding), has not

been explored in greater depth, especially from a South African perspective. On the subject of higher education funding subsidy, literature surveyed tends to concentrate on the legal and restructuring implications rather than on the effects that the research component thereof might have on knowledge production. For instance, Akor and Roux (2006) have examined the uncertainties pertaining to higher education funding arrangements and the implications for institutional autonomy and academic freedom. They were concerned with government's interference in the way HEIs utilise their funds, what and how they teach and the number of students to enrol for particular courses.

The literature review suggests that the relationship between the new higher education funding framework in South Africa and its possible effects on knowledge production has been significantly less discussed or documented. This study, therefore, serves to fill the vacuum created by the absence or lack of documented research on the effects that the research component of the New Funding Framework for subsidising higher education has on knowledge production.

In conclusion, I would like to emphasise that this study is located within the strides made by Akor and Roux (2006), Bunting (2002), Cloete and Bunting (2000), De Villiers and Steyn (2006), Madue (2006) and Melck (1982) following changes in the financing of public higher education institutions in South Africa. The above literature review has helped in anchoring this study on the contributions of authors such as Bunting, Cloete, Melck, Mubangizi, Steyn, Stumpf, and Wessels, among others, as a basis of gearing towards conducting a comparative analysis of South Africa's two higher education funding regimes, as presented in Chapter 4.

Chapter 4

Putting up the structure - A comparative analysis of the two funding regimes

There are immense opportunities to pursue the key goals of public higher education in South Africa, including economic development, high-level contributions to the knowledge economy, and the advancement of critical enquiry that is essential to a healthy democracy –SAUVCA 2002[35]

4.1. Introduction

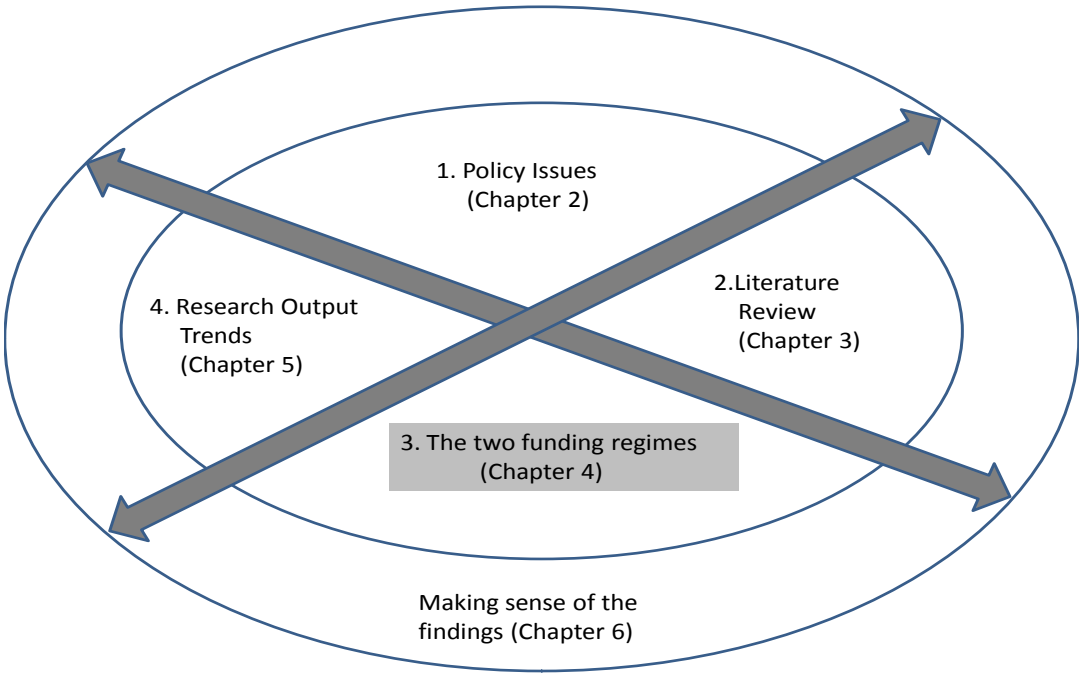
This chapter examines the complex relationship between the current South African higher education funding policy and its predecessors within the context of the international debate on the subject of knowledge production. In this chapter, a detailed background of the funding policy framework that led to the enactment of the new higher education funding policy in South Africa is presented. A comparison of the previous and current government policies is conducted to cement the discourse on policy changes and continuities as discussed in Chapter 2.

The purpose of this chapter is to illuminate the similarities and identify major differences between previous policies and the current policy, in relation with the effects that such policies have on knowledge production. The focus of this comparative analysis of NFF and its predecessors is limited to trace the fundamental changes that took place in the South African higher education funding framework since the 1980's. The starting point for this chapter is on the outlining of the adopted definitions of concept of "research output" and how research findings are communicated before discussing the funding

[35] The South African Universities Vice-Chancellors Association (SAUCA) has, in response to the Minister of Education's restructuring proposals gazetted on 24 June 2002, published a position paper entitled "A vision for South African higher education transformation, restructuring and policy integration" in November 2002.

formulas. The aim of this chapter is to lay a foundation for Chapter 5 which will concentrate on tracing the research output of public higher education institutions in South Africa. Figure 4.1. serves to graphically position this chapter as the third of the four main pillars of the thesis.

Figure 4.1. Chapter 4 (The two funding regimes), third pillar



It was claimed in Chapter 1 that the assessment of the performance of institutions of higher education, in terms of knowledge production, is common practice among public institutions internationally, and is increasingly contested and controversial. (See Section 1.4. "Research Problem"). Various definitions of research (which forms an integral part of knowledge production), which largely concur, are used by those organisations which have an impact on South African higher education institutions' knowledge production. Although numerous definitions of knowledge production, more especially from the public administration and education's perspective were outlined in detail in Chapter 3, the definitions in this chapter are strongly biased towards research.

4.2. Defining research and research output

According to the WP3, the production, advancement and dissemination of knowledge and the development of high-level human resources are core functions of the higher education system. Research plays a key role in both functions. However, Levin (2004:2) posits that the term "research" is itself contested and can cover quite a wide range of activities, from carefully designed studies by independent, university-based researchers to analysis of data for particular administrative or political purposes to arguments for specific policy positions that may be more or less well grounded in evidence. What Levin's argument implies is that definitions of research[36] are aplenty and used in different contexts. In the context of this study, consideration is, therefore, given to definitions provided by the DoE, the National Research Foundation (NRF) and Higher Education South Africa (HESA). Another definition of research that enjoys recognition in this study is that which is outlined by the Organisation for Economic Co-operation and Development (OECD), to add an international perspective.

To start with, according to the DoE (1997:3) research refers to original investigation that is aimed at gaining knowledge and understanding. It does not include routine work which is designed to establish conventional conclusions, but includes innovative work and consultancy, that may lead to new techniques or artefacts and; new or substantially improved insights. The NRF (2007:12) regards research as "original investigation undertaken to gain knowledge and/or enhance understanding". It further elaborates further, that research specifically includes:

[36] According to the OECD (1992) as cited in Bawa and Mouton (2002:315), the following are the official *Frascati* definitions: **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 sectors 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 recognised 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 recognised problems.

a) The creation and development of the intellectual infrastructure of subjects and disciplines (e.g. through dictionaries, scholarly editions, catalogues and contributions to major research databases); and
b) Building on existing knowledge to produce new or substantially improved materials, devices, products, policies or processes.

Research plays a very important role in improving people's lives. In the public arena, before policies can be developed and implemented, research is usually conducted to inform policy formulation or decision making. It should be stated that research is conducted for different reasons and usage, and takes various approaches. The OECD (1992) states that research and experimental development (R&D) comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. Middaugh (2001:38) sums it up when writing that:

> *Research or scholarship – includes an array of activities such as conducting experimental or scholarly research, developing creative works, preparing or reviewing articles or books, preparing and reviewing proposals for external funding, performing or exhibiting works in the fine and applied arts, and attending professional meetings or conferences essential to remaining current in one's field.*

In analysing various definitions of research, HESA (2005:2) concludes that research specifically excludes routine testing and analysis of materials, components, instruments and processes, as distinct from the development of new analytical techniques; as well as the development of teaching practices that do not embody substantial original enquiry.

The CHE (2004:08) argues that in countries like South Africa, research often has understanding social change as a specific focus and collective and

individual developmental objective. In joining the discourse on research, Madue (2006:11) posits that research in the social and human sciences is a reliable source of direction and good practice for both community-based and non-governmental organisations, international and development agencies, educational institutions and civil society at large. Therefore, research results need to be effectively communicated to all the relevant stakeholders.

4.3. Communicating research output

It is generally conceded that, in fact, the feature which distinguishes a university from any other educational institution is the research output[37] of its faculty members without which teachers cannot lay claim to being in constant touch with the frontiers of their subject (Melck, 1982:57). Jinabhai (2003:55) affirms that research forms a fundamental component of the higher education system, as a significant performance indicator.

Aside from imparting existing knowledge to students through teaching, the work of a university scholar or scientist is devoted to creating new knowledge for other scholars and scientists to use, apply, and build upon, for the benefit of us all (Harnad, 2003:1). It is for this reason that research results or output needs to be effectively communicated to the stakeholders[38] for their various usages. Porter *et al*., (2007:117) asserts that research spirals inward; science cascades outward. This dual image supports a vital realisation – scientific advance requires knowledge transfer among researchers who may focus tightly on extremely circumscribed research issues. The typical research investigation burrows into detail, cumulating

[37] According to Melck (1982), the teaching of postgraduate students of necessity entails supervised research in some or other form. It is, therefore, apparent that any measure of a university's output must include this essential element, as before and if possible in both physical and value terms.
[38] The term is used to denote parties interested in the research output and includes: faculty members and peers, university senior management, government departments and agencies.

information, probing for nuances. Once completed, the challenge shifts to communicating research findings (*ibid*.).

According to Beyer, Chanove and Fox (1995:1219), one defining characteristic of a scientific contribution is that it must be communicated to other scientists. Moreover, in terms of the economics of publicly funded education and basic research, Salter and Martin (2001:511) stress that with government funding, new economically useful information is created and the distribution of this information is enhanced through the tradition of public disclosure in science. (See Section 3.3.1. "The economic benefits of funding higher education"). The main product emanating from government-funded research is viewed as being socially and economically useful information which is freely available in various forms. This includes published information. Communicating research output is mostly done through publication. Published scientific literature comprises of a varied codified knowledge that can be diffused, absorbed, stored or recorded for future use by researchers and institutions.

Publishing is, according to Madue (2006:15) a central social process of science across all disciplines because it is through publication that the research findings and results are communicated and exchanged. Benham, Clark and Francis (2006:501) add that publication of research plays an essential role in the stimulation and dissemination of scientific knowledge. In relation with dissemination or publishing of research results, The Academy of Science of South Africa (ASSAf)[39] (2006:06) further states that the fundamental principle of research publishing is that reported findings must be original, in the sense that they are the first report of such findings. In emphasising the importance of publishing research findings, Porter *et al*., (2007:118) conclude that:

[39] The Academy of Science of South Africa (ASSAf) was inaugurated in May 1996. It was formed in response to the need for an Academy of Science consonant with the dawn of democracy in South Africa: activist in its mission of using science for the benefit of society, with a mandate encompassing all fields of scientific enquiry in a seamless way, and including in its ranks the full diversity of South Africa's distinguished scientists.

Research knowledge needs to be suitably conveyed to others working on the same immediate problem – and to a wider circle of colleagues working on related problems – and beyond, to those who may gain usable knowledge for different applications from the findings.

Echoing the sentiments of Porter *et al*., (2007) I would like to emphasise that research output in the form of both publications and creative outputs needs to be of a suitable standard to both its end-users and funding agencies. However, there is no automatic consensus on indicators of research output. For instance, in the engineering and natural sciences, journal articles are the preferred measure of quality while in the human sciences such as History and Political Science, books may be accorded a higher preference over published articles. Various issues need to be borne in mind, amongst others, discipline specific practices and the stage of development of the individual researcher. Higgins[40] (2008:2) argues that in the humanities quality is most visible through the assessment of an individual academic's national and international visibility and impact of their work on a global community of scholars. Ratings therefore tend to rely on the publication and reception of scholarly monographs (*ibid*.). It can thus be argued that in comparison with the human sciences, the engineering and natural sciences highly rates the co-authoring of articles and conference papers.

From the foregoing, it can be argued that it is under such circumstances that the assessment of the performance of higher education institutions, in relation with their knowledge production becomes controversial. Again, funding of higher education institutions' performance is done through the use of formulas which are themselves complex. McKeown-Moak (1999:99) stresses that despite the long history of use, controversy has surrounded the use of state funding formulas for higher education since their inception. It is for this reason that this thesis examines the use of funding formula in

[40] John Higgins is professor of English at the University of Cape Town.

financing higher education. But perhaps before discussing funding formulas, it is vital to discuss avenues used to finance higher education.

4.4. Financing higher education

From the foregoing discussion, it is clear that there are various ways of financing higher education. Genua (2001:610) describes three channels for direct financing of higher education by the state:

(a) Incremental funding – "funds are allocated on the basis of past expenditure levels with incremental resources made available for the development of new activities".

(b) Formula funding – "the budget of the institution is determined by some form of assessment of the actual institutional expenditure per student enrolled or expected to be enrolled. Research funds can also be determined by a formula system that allows the distribution of the funds in a selective way on the basis of research record".

(c) Contractual funding – "is applied via tender schemes. Public funding agencies issue targets in terms of student numbers or research and the various institutions apply for the funds to carry out specified tasks. There are different forms of contracting depending on the existence of fixed limits for the availability of funds and in the degree of specificity of the activity. In the case of limited funds and tightly specified targets, universities have to compete with one another for the resources".

Genua finds that "although there is a high level of diversity in the mix of the different funding system in the EU, recent years have seen an increasing reliance upon formula and contract funding" (*ibid.*). This thesis, and in particular this chapter, is concerned with formula based funding. Other avenues of financing higher education are therefore excluded from the discussions.

4.5. Funding formulas

Operationally, Marks and Caruthers (1999:5) define funding formulas as a system that links resources mathematically to an institution's characteristics. Deaton (2004:1) adds that funding formulas generally incorporate calculations for instruction, academic support, research, public service, and other functions in a series of "mini-formulas" or calculations. The process is by nature an inexact science (*ibid*.). Lang (2005:373) defines a university funding formula as a formally defined procedure, based on data that can vary and be manipulated according to definite and predetermined factors, which can be used to determine funding requirements for a system of universities or to allocate funding to individual institutions within a system, or both.

McKeown-Moak (1999:99) asserts that funding formulas have evolved over time into complicated methodologies for allocating public funds. Although funding formulas provide some rationale and continuity in allocating state funds for higher education, formulas are designed and utilised for many purposes, including measurement of productivity (*ibid.*). Deaton (2004:3) cautions that modelling, through a formula, the vast and complex enterprise of a higher education system is a daunting task, and there is no universally preferred method. While agreeing with Deaton, my contention is that governments use different formulas in financing or subsidising higher education. In fact, there are a number of advantages to the use of funding formulas in subsidising higher education institutions. For example, Deaton (2004:3) argues that with a funding formula in place, the funding process is free from political influence and is transparent for all to see. Policy and politics are reserved for the formula design, an appropriate arena for policy decisions to be debated. It also allows for future policy decisions to be informed by modelling the funding structure based on hypothetical data scenarios (*ibid*.). An illumination of the advantages of the formulas follows hereafter.

4.5.1. Advantages of funding formulas

It was earlier mentioned that the higher education funding formulas in South Africa have been used since the 1950s. In supporting this fact from the Canadian perspective, Gross in Lang (2005:371) explains that formulas have been in use in many jurisdictions since the early 1950s to allocate public funds among universities and colleges, and the basic concept of formula funding can be traced to as early as 1912. What then are the advantages of funding formulas that render them more usable over other forms of funding? According to Lang (2005:372-373) some of the advantages of funding formulas are: (a) Formulas are visibly equitable. This characteristic becomes more important as the claims on limited public funding expand or as public funding shrinks; (b) Formulas are predictable. They assure a base from which individual institutions can plan and behave strategically; (c) Formulas provide a common and comprehensible foundation for decision making. Without referring to an external agency, a college or university that is funded by a formula can, for example, project the revenue implications of an expansion of enrolment or addition of a new programme; (d) Formulas reduce political interference; (e) Formulas reduce the need for political lobbying; (f) Formulas assure private benefactors that their gifts will supplement, not supplant, public funding; (g) Formulas can protect institutional autonomy; and (h) Because formulas are auditable they can form a basis for public accountability and for increased institutional responsibility.

In recognising the above advantages, more especially from the South African perspective, Steyn and De Villiers (2006:34) stress that a subsidy policy based on a well-defined and transparent formula has several advantages, the most important of which are the following: (a) Subsidy formula ensures that funding takes place in a fair and objective way, without taking subjective considerations into account. It therefore usually depoliticises the allocation of funds to a large extent; (b) A subsidy formula

may be regarded as a contract between two parties, in this case the state, represented by the Minister of Education, and a higher education institution. The state provides funds to institutions for specific educational purposes, while the institution renders these educational services to the public; (c) Funding based on a subsidy formula gives greater recognition to the autonomy of an institution since the state usually (except in the case of limited earmarked amounts) does not prescribe how the allocated amount has to be spent. This differs radically from the so-called needs-based budgeting with extensive earmarking of amounts; (d) A subsidy formula ensures that the rules of the funding game are known in advance and therefore promotes medium and even long-term planning by an institution; and (e) Subsidy formulas are designed to be flexible in order to accommodate as many fluctuating factors (input parameters) as possible. Cost escalation is an example of such a factor and needs to be incorporated in any legitimate subsidy formula. However, since a subsidy formula cannot discount all (sometimes institution specific) factors, it is only an approximation and represents a funding model for an "average" institution.

The advantages of the funding formulas explain the trust that various governments have had on their use for funding HEIs over a number of years. To date, funding formulas still enjoy preference over other means of subsidising HEIs. Deaton (2004:3) explains that governments use either an incremental funding approach or a formula funding approach to determine state appropriations for higher education. As was pointed out above, incremental funding involves increasing or decreasing funding for a particular cycle on the prior year's allocation. In contrast, the formula method quantifies funding decisions based on variables and data sets (*ibid*.). Variables of the funding methods include among others: the teaching input, block grants, student financing and research output. The variable for this thesis is the research output. Yang (2010:13) explains that an analysis is "univariate" if it is focused on only one variable. Since the above section has concentrated on singing praise of funding formulas, the other side of the coin, i.e. the disadvantages thereof also need equal consideration.

4.5.2. Disadvantages of funding formulas

In weighing the acceptability of the formulas, advantages should be put on the scale in comparison with their disadvantages. Formulas do have shortcomings, and according to McKeown-Moak (1999:103) there have been many heated debates as to whether the advantages of formulas outweigh their downside. This might explain the popularity of the funding formulas. Lang (2005:373) has identified the following major disadvantages of funding formulas: (a) As a funding formula becomes more predictable (an advantage), it may become complex, which might be seen as a disadvantage; (b) Funding formulas, as a form of public finance, create entitlements; and (c) The funders and the funded may not view funding formulas in the same way. For example, governments often favour enrolment-driven funding formulas because they tend to promote accessibility and accountability as an alternative to close and difficult budgetary management. Universities on the other hand prefer to protect their autonomy from more intrusive forms of accountability that might be deployed in the absence of a funding formula.

In comparison with Lang (2005), Steyn and De Villiers (2006:34-35) have singled out only one disadvantage by stating that a disadvantage of any formula based funding mechanism is that the clients served by the formula will inevitably, after a year or two, start to exploit the formula by finding loopholes in its composition or in the definition or calculation of input parameters. As a result, the effectiveness of the funding formula diminishes over time. It is therefore crucial for the state to deem any subsidy formula as dynamic and while it will be contra productive to revise the formula annually, it should be scrutinised carefully every five years with a possible revision in time (*ibid*.). Some of the disadvantages of formulas as identified by McKeown-Moak (1999:103) include the following: (a) Formulas may be used to reduce all academic programmes to a common level of mediocrity by funding each one equally because quantitative measures cannot assess

the quality of a programme; (b) Formulas cannot serve as substitutes for public policy decisions; (c) Formulas may perpetuate inequalities in funding that existed before their advent because they may rely on historical cost data; (d) Enrolment-driven formulas may be inadequate to meet the needs of changing client bases or new programme initiatives; and (e) Formulas are only as accurate as the data on which they are based.

In South Africa, funding formulas have been in use since the 1950s to determine the government's subsidy allocation to HEIs. The lifespan of funding formulas used in South Africa varies considerably. While some formulas were used for about 20 years, others had a shorter lifespan of less than 5 years. Having discussed the advantages and disadvantages of funding formulas, as well as a brief indication of the use of funding formulas, my starting point in attempting to answer the research question is to review South Africa's higher education funding policy framework, from the pre-democracy era to the current policies.

4.6. Historical overview of higher education funding in South Africa

Although the focus of this analysis is limited to trace the fundamental changes that took place in the South African higher education funding framework since the 1980's, it is important to mention that higher education funding can be traced back to the 1950s. Steyn and De Villiers have in 2006 documented different funding mechanisms for universities and technikons since 1951. According to Steyn and De Villiers (2006:35), from 1951, and until the NFF introduced in 2001, the following four reports supported various formulas that have been used as a basis for funding universities:

a) The Report of the Holloway Commission (1951);
b) The Report of the Van Wyk de Vries Commission (1974);

c) The Report of the Venter Commission (1985); and
d) The reports of the Department of National Education in 1992, namely, the NASOP 02-325 (92/11) (for universities) and the report NATED 02-326 (92/11) (for technikons).

The Holloway formula, named after the Holloway Commission was adopted and utilised as a means of funding South African universities since 1953. According to Steyn and De Villiers (2006:36) the Holloway formula was used for 20 years to determine the respective subsidies for South African universities. During this period, minor revisions to the formula were effected in 1959, 1964 and 1969. The Holloway formula was then replaced by the Van Wyk de Vries formula in 1974.

Although the Van Wyk de Vries Commission was appointed by the government to study the higher education funding pattern in 1968, its study was only completed in 1974, but its recommendations were only implemented in 1977 (Steyn and De Villiers, 2006:35). After scrapping the Holloway formula, but before the Van Wyk de Vries Commission formula was implemented, universities were funded for a few years in an *ad hoc* way (*ibid*.). The Van Wyk de Vries formula had a short lifespan in that it was replaced with the South African Post-Secondary Education (SAPSE) formula introduced in 1984, aimed at subsidising the universities.

Although introduced in 1984, the SAPSE formula was developed in 1982. It was only in 1987 that a version of the SAPSE formula was introduced to cater for the subsidisation of the technikons. Orr (2005:32) is of the opinion that a real paradigm shift is noticeable in the use of the funding method in most higher education systems in the world. State funding[41] was previously provided in accordance with the deficiency principle. Since universities were

[41] According to Orr, this was the argument used by von Humboldt in the German situation in 1999, but also in the middle of the 20th century by the British University Grants Committee.

not seen to be in a position to raise any money from other sources without being negatively influenced by their benefactors, state money was provided (*ibid.*). Of the various funding formulas presented above, only the last two mentioned in (d) above will receive attention in this study, as a means of comparing them with the new higher education funding policy.

4.6.1. The South African Post-Secondary Education funding formula

In discussing the conceptual framework for higher education under apartheid, Bunting (2002:60) correctly starts by stating that the introduction of the 1983 constitution in the Republic of South Africa, with its distinction between “general” and “own affairs”, entrenched the apartheid divisions in education in South Africa. Although the system was apartheid in nature, the funding formula did not always discriminate against HBUs. In other words, the formula was neutral. A direct consequence was that higher education institutions had to be designated as being for the exclusive use of one of the four race groups: African, Coloured, Indian and White. Steyn and De Villiers (2006:2) elaborate that the SAPSE information system was introduced in the early 1980s for the so-called Historically Advantaged (predominantly white) Universities (HAUs).

By the beginning of 1985, a total of 19 higher education institutions had been designated as being “for the exclusive use of whites”, two as being “for the exclusive use of coloureds”, two “for the exclusive use of Indians”, and six as being “for the exclusive use of Africans” (Bunting, 2002:60). Bawa and Mouton (2002:311) add that in 1985 the Department of National Education, which was responsible for the national education system under apartheid, introduced a new funding formula for universities that incorporated a number of incentives to stimulate research output. The new funding formula made explicit provision not only for teaching output, but also for the contribution made by research (*ibid*.). In essence, in terms of the SAPSE funding

formula, the government was theoretically funding 80% of the funding needs of higher education institutions, while the remaining 20% of costs was the responsibility of the institutions themselves.

In the 1980s, the SAPSE formula was detrimental to the Historically Disadvantaged Universities (HDUs), which were mainly black and were financially struggling. While the Historically White Universities (HWUs) were highly subsidised, the HDUs received a far lower subsidy to enable them to compete fairly with the HWUs. Llorah (2006:86) writes that by segregating schooling, and in particular by starving the HBUs of resources that negatively impacted on their output (research and postgraduates), compared to the historically white universities (HWUs), the apartheid regime sought to discourage demand for education among blacks. The HDUs did not fully enjoy government's subsidy through the SAPSE funding mechanism with regard to the enhancement of their research output. In comparison with the HDUs, the technikons were at first somehow worse off since they were also not considered in the SAPSE funding formula until 1986. The technikons had their special funding introduced only in 1987.

An adaptation of an earlier (1984) version of the SAPSE formula was according to the Steyn and De Villiers (2006:35), introduced in 1987 as a basis for subsidising the technikons. Steyn and De Villiers (*ibid.*41) continue to explain that since technikons' organisational and operational systems showed many similarities to universities, the Minister of National Education decided in 1987 to use an adapted (scaled down) version of the SAPSE subsidy formula for universities to subsidise technikons. Jinabhai (2003:54) writes that in 1988 the formula was refined and called the Refined SAPSE Subsidy Formula which was computed on 50% full time equivalent enrolment and 50% full time equivalent pass norms (outputs in other words) as set by the Department.

The continued changes in the university and technikon sectors, and especially the high growth in student numbers[42] during the late 1980s and early 1990s, necessitated a further revision of the respective SAPSE formulas for universities and technikons (Steyn, 2002:253). According to Jinabhai (2003:54) the SAPSE formula had a detrimental impact on historically disadvantaged institutions which had opened its doors in the name of access. In essence, since the formula was enrolment driven, it created a turnstile effect or revolving door syndrome, where under-prepared students entered and exited HEIs because of their inability to cope with the demands of the tertiary nature of education.

In the early 1990s various non-governmental investigations were launched into future higher education policies for a post-apartheid South Africa. During these debates the SAPSE funding formula was taken to be a flawed document, and strong objections were expressed to its underlying principles (Bunting, 2002:128). This era has marked a turning point for restructuring of the subsidy formula and has led to the conceiving of the NFF.

In the light of continuous debates and changes in higher education funding, the SAPSE system including that of subsidising the technikons was again according to Steyn and De Villiers (2006:35) drastically revised, with effect from 1993. In this statement, Steyn and De Villiers confirm Steyn and Vermeulen's (1998:254) finding where they argued that although technikons were funded from a funding system almost similar to that of universities in 1987, it was only in 1993 that a unique technikon-funding framework was implemented within the South African SAPSE system.

[42] As far as the technikons are concerns, Jinabhai *(ibid*.55) explains that part of the problem could be traced to the philosophy of technikon education policy guidelines prior to 1990. The Philosophy of Technikon Education (NATED 02-118, 1988) focused and concentrated mainly on vocational and career-oriented features of the programmes offered by Technikons.

Bunting (2002:128) reports that, the pre-1994 objections to the SAPSE funding formula were taken up by the National Commission on Higher Education (NCHE). Bunting cites the example of the NCHE's finance task team's conclusion[43] about the SAPSE formula in which it states:

> *… most of the mechanisms used by the South African government for distributing its higher education funding should not be employed in a new, transformed system. The fundamental problems are that current mechanisms are based on assumptions which clash with certain of the values and principles which flow from the 1995 Education White Paper, and the present formulae have contained incentives which have distorted the higher education system (NCHE finance task team, 1996:38).*

The former Department of National Education set out the revised SAPSE formulas[44] for universities and technikons in two policy reports in 1992 (Steyn, 2002:253). Again in 1997, the two policy reports made way for the *Information Survey Manual – Research Output of Universities (Report 014/97)* and *Information Survey Manual – Research Output of Technikons (Report 024/97)*.

4.6.2. Information Survey Manuals – Report 014/97 and Report 024/97

It is perhaps very appropriate that an analysis of the state of South African scientific research is conducted exactly 20 years after this rather unique incentive/reward scheme was introduced by the then National Department of Education in 1985. A few studies have been conducted over the years to review the effectiveness and appropriateness of the scheme. Despite these studies, many perceptions about the quality or lack thereof remain (ASSAf, 2006:29). Every year each university submits information regarding research

[43] For a detailed view of the key problems which the NCHE finance task team has highlighted, see Bunting (2002:129-130).
[44] For a detailed discussion of the revised SAPSE formula for universities and technikons, see Steyn and Vermeulen (1998).

output together with its supporting documents and material relating to its research output to the Department of Education in Pretoria.

The *Information Survey Manual – Research Output of Universities (Report 014/97)* (hereinafter referred to as the *Information Survey Manual*), contains the subsidy formula that was used as the basis for the annual allocation of funds to universities for research. Yet, in 1997, the government was only able to contribute 66% (which include tuition fees) of the 80% that it has promised through the SAPSE funding formula. This was indicative that the SAPSE funding formula was no longer viable.

The subsidy formula laid down in the *Information Survey Manual* was used as the basis for the annual allocation of funds to universities. Although the Information Survey Manual regarded student numbers of prime importance, the research output of a university was also taken into consideration. According to this policy, the research output of a university comprises of original research papers, research letters and review articles which appear in approved journals[45], as well as books for the specialist and patents that comply with predetermined criteria. The format and forms used for the submission of different categories of recommended research outputs are tabled in Annexure A – E of the *Information Survey Manual*. It should be noted that in the case of research articles, only articles published in the approved list of journals[46] appearing in Annexure E of the *Information Survey Manual* were considered for subsidy purposes.

Section 2 of the *Information Survey Manual* states that the funding formula for universities, as in the case of previous subsidy formulae, gives

[45] Approved journals refer to International Journals (Includes SA), Master list of the Institute of Scientific Information (ISI)-SCI, SSCI & A&HCI and International Bibliography of Social Sciences (IBSS).
[46] This list was originally completed in July 1986 and at that stage consisted of all the journals that appeared in the three citation indexes of the "Institute for Scientific Information (ISI)" namely the "Science Citation Index" the "Social Sciences Citation Index" and the "Arts and Humanities Citation Index" as well as the journals which appeared in the so-called "Supplementary list" of high standard journals.

recognition to the very significant and fundamental role played by research at universities, and ensures that research activities are placed on a sound basis. According to the *Information Survey Manual* (1997(a):5), the published research material which can be regarded as the research output of universities, should satisfy the highest scientific standards and requirements. University councils, senates and research committees are expected to jealously apply this principle when determining research output. The *Information Survey Manual* (1997(a):5) further states its general purpose as:

> *… to stimulate research at the highest level and thereby to encourage the development of excellence for research at universities. For this reason the research material which may be considered as part of the research output of universities should include only the very best of their research achievements.*

It should be noted that with this policy, the DoE has used different procedures for subsidising universities and technikons. In case of the universities, the *Information Survey Manual – Research Output of Universities (Report 014/97)* was used, while for the technikons, the *Information Survey Manual – Research Output of Technikons (Report 024/97)* was used. Steyn and De Villiers (2006:35) assert that the SAPSE subsidy formulas for funding universities and technikons, respectively, were used for the allocation of subsidies to universities and technikons until the 2003/04 financial year for tuition.

The old higher education funding formulas have received numerous criticisms it terms of both their rationale and implementation. For example, Pillay (2003:2) writes that one of the features of the apartheid model was that it contained an implicit assumption that the government is the funder-of-last-resort of the higher education system. As the funder-of-last-resort, government subsidies for universities and technikons are supposed to be

based on (a) determinations of the actual costs of reasonably efficient institutions, and (b) decisions on which of these costs should be covered by government subsidies. The costs not covered by government subsidies would have to be met by institutions from their private income sources, primarily their student tuition fees. How different then is the new higher education funding framework from its predecessors? Why was it necessary to introduce the new subsidy policy?

4.6.3. The new funding framework for higher education: *"Policy for the measurement of research output of public higher education institutions in South Africa"*

The Minister of Education gazetted *The Policy for the Measurement of Research Output of Public Higher Education Institutions in South Africa* (Government Gazette No. 25583) in 2001. The purpose of the policy is to encourage research productivity by rewarding high quality research output at public higher education institutions. However, the new funding framework is not intended to measure all output, but to enhance productivity by recognising the major types of research output produced by higher education institutions and by using appropriate proxies to determine the quality of such output. As a general rule, research output emanating from commissioned research or contracts paid by contracting organisations would not be subsidised by the Department of Education. The correlation between the implementation of the current policy on subsidisation of higher education institutions and knowledge production by higher education institutions is still not documented to date.

A comparison between the current policy and its predecessors will therefore, unravel the similarities and differences that might influence HEIs in their quest to improve their annual research output. The *Information Survey Manual* is hereafter compared with the current *Policy and procedures for*

measurement of research output of public higher education institutions in South Africa. In line with the WP3 which outlines a single coordinated higher education system, this policy applies to all public education institutions, and thus does not differentiate between universities and technikons (DoE, 1997(b):1). The DoE (1997(b):70) stresses that this policy aims to sustain current research strengths and to promote research and other knowledge outputs required to meet the national development needs. A consideration of the major differences between the current policy and the previous policies is worth noting.

The development of the current NFF was driven by the imperatives for transformation of the higher education system contained in WP3 and the National Plan for Higher Education (2001). The WP3 is regarded as a support instrument that has laid a foundation for the National Plan for Higher Education, the New Academic Policy (replacing Reports 115 & 150) and the NFF. Steyn and De Villiers (2006:48) write that the introduction of the NFF completed a very long and arduous process of developing a new formula which started with the funding proposals of the National Commission on Higher Education (1996), followed by the refinement of these proposals in Chapter 4 of WP3.

The framework, according to the DoE (1997(c):4.14), was required to accelerate the process of transforming the system of higher education in the country. The NFF has to be performance and goal oriented in order to contribute to meeting the aims and objectives of transforming the system of higher education, which include equitable access of students, better quality of research and teaching, better student graduation and progression rates, and better responsiveness to economic and social needs (*ibid*.). According to Steyn and De Villiers (2006:56) the framework purports to provide incentives for institutions to become efficient, namely by subsidising the outputs of research and teaching. This is done by setting norms for research

outputs per member of permanent academic staff and norms for graduation rates.

4.6.3.1. Background for the new funding framework

Bawa and Mouton (2002:303) write that the White Paper identified two key capacity difficulties: the fragmented national system, the lack of research capacity in the higher education sector, the "stark race and gender imbalances", and the skewed distribution of the capacity between the historically black institutions and the historically white ones. The transformation agenda in South Africa sought to create a single co-ordinated higher education system through the *Higher Education Act of 1997*. Ndebele (2004) cautions that, in 1994, "transformation" originally understood as a complex and creative process of change, began to be reducible to a single measure of success: race. Sometimes concessions were made to gender and disability. In this context, for an institution to be declared "*untransformed*" could lead to a damning crisis of legitimacy (*ibid*.).

The need for a single co-ordinated higher education system was highlighted by the recommendations of the NCHE in its 1996 report. One of the Commission's findings was "the absence of any sense of system in South African higher education". The Commission highlighted the following three major systemic shortcomings: (a) There was a chronic mismatch between higher education's output and the needs of a modernising economy; (b) There was a strong inclination towards closed-system disciplinary approaches and programmes that has led to inadequately contextualised teaching and research. The content of the knowledge produced and disseminated was insufficiently responsive to the problems and needs of the African continent, the southern African region, or the vast numbers of poor rural people in our society; and (d) There was a lack of regulatory frameworks, because of a long history of organisational and administrative

fragmentation and a weak accountability. This inhibited planning and co-ordination, the elimination of duplication and waste, the promotion of better articulation and mobility, and the effective evaluation of quality and efficiency (NCHE, 1996:2). (See Section 1.4. "Research Problem").

From the above shortcomings, the NCHE (1996:89) recommended that higher education in South Africa should be conceptualised, planned, governed and funded as a single co-ordinated system. In line with the NCHE's recommendations and the subsequent *Higher Education Act of 1997,* the *Policy and Procedures for Measurement of Research Output of Higher Education Institutions in South Africa, 2003* has replaced the *Information Survey Manual – Research Output of Universities (Report 014/97)*, and *Information Survey Manual – Research Output of Technikons (Report 024/97)*. [47]

In embracing the NFF, the DoE stresses that the NFF departs from the assumptions of the old SAPSE formulas in keys respects as it states that: (a) *The size and shape of the higher education system cannot be determined by the student demand and institutional decisions alone; and (b) The starting point for determining the allocation of funds cannot be institutional costs. In the old formula, the allocation of funds was linked to the generation of an 'ideal income' for individual institutions based on the determination of actual costs, irrespective of affordability criteria or whether the costs are linked to the principal activity of higher educatio*n institutions*, that is, teaching, research and community service (DoE,1997(a)).*

In departing from the background to the new funding framework, it is important that, before critically analysing the policy and procedures for the measurement of research output of public higher education institutions, a

[47] Technikons have been merged with major universities or with other technikons and are now known as universities of technology.

brief outline of the categories of new grants to higher education institutions (in terms of the NFF) be highlighted.

4.6.3.2. Categories of the new grants to higher education institutions

The NFF comprises of one set of funding policies and mechanisms for the higher education system. The funding is based mainly on eligibility criteria which are dependent on available (seats) student places in approved fields of learning and levels of study as mandated by the Ministry of Education. The funding allocation is based on three windows, namely:

(a) Block Grant Funding

The block grant funding refers to institutional set-up subsidy costs (basic running costs irrespective of size or number of students). The subsidy is paid to institutions on the basis of their planned full time equivalent (FTEs) in different fields of study. Block grants are according to the Ministry of Education (2003:2.1) undesignated amounts to cover higher education's operational costs which are linked to the provision of activities related to research and teaching. The Ministry of Education further states that higher education block grants consist of the following sub-categories: Teaching Output Grants, Teaching Input Grants; and Institutional Factor Grants that the HEIs should apply for if their research output is below the required norm.

(b) Earmarked Funding

These funds are directly allocated to HEIs to achieve specific institutional purposes. Under this category, funding is earmarked for a national student financial aid scheme; institutional development and redress; interest and redemption payments; approved capital projects;

research development and other developmental projects. As an example, the Ministry of Education (2003:4.1) stipulates that earmarked grants are allocated to higher education institutions to fund the National Student Financial Aid Scheme (NSFAS). (See Section 1.4. "Problem statement"). Earmarked funding takes the form of direct funding of HEIs.

Other forms of earmarked funding exist in the field of research. Steyn and De Villiers (2006:75) write that in order to ensure that the necessary research will be undertaken in specific or priority areas that are important for a country, most governments have established funding agencies with the necessary expertise to determine worthwhile research projects at HEIs. In South Africa, government earmarked allocations for research at HEIs (by means of various budget votes) are then transferred to respective agencies for dissemination amongst HEIs (*ibid*.). This research study, for example, is a beneficiary of such an arrangement through a research grant received from the NRF as one of the government funding agencies. Other research funding agencies that are responsible for disbursement of earmarked funds to HEIs include among others the Medical Research Council (MRC), the Agricultural Research Council (ARC), as well as the Water Research Commission (WRC).

(c) Research and development outputs

The funding for this category is of paramount importance from my point of view. The then subsidies made to institutions of higher learning for "blind research funding" has fallen off as the current funding framework is output driven. The research and development funding component comprises of:

- Research scholarships, i.e. at Masters' and PhD levels;

- Facilitating research collaboration at regional and national levels; and
- Publication output.

An institution's research output grant for any funding year *n* is dependent on (a) actual totals of research graduates and research publication units for the year *n-2*, and (b) a normative total which it should have produced in terms of national benchmarks (Ministry of Education, 2004:12).

Doctoral and research masters graduates and publication units are recognised as research outputs for the purposes of the calculation of research output (Ministry of Education, 2003:14). However, it should be noted that contrary to the DoE recognising Doctoral and Masters' research, the national funding agencies such as the NRF do not support masters by course work in their funding programmes.

HEIs may for funding purposes drive students towards registering for research masters by dissertation programmes as opposed to the masters by course work. Malada and Netswera (2007:05) stress that it is estimated that universities receive subsidy of between R100 000 and R200 000 for a masters' graduate and between R250 000 and R500 000 for a doctoral graduate. These amounts vary from year to year. In agreement with Malada and Netswera (2007), Gower (2008:12) further explains that qualifications in science and engineering are better subsidised than the humanities, while doctoral qualifications command high subsidies. No two universities receive the same subsidy, he concludes. The weightings applied to these three categories of outputs during the triennium are set out in Table 4.1. below.

Table 4.1. Research output weightings

Weightings for research outputs			
Research outputs category	**2004/05**	**2005/06**	**2006/07**
Publication units	1	1	1
Research masters graduates	1	1	1
Doctoral graduates	3	3	3

Source: Ministry of Education (2003)

In accounting terms, the weightings can be illustrated by means of an equation in this way:

Research output units = approved publication units + research masters graduates + 3x doctoral graduates

According to the Ministry of Education (2006:14), the research output calculations for the funding year 2007/08 will be based on audited outputs for 2005 and for 2008/09 on audited outputs for 2006. Garnett and Pelser (2007:56) explain that research outputs for HEIs as provided by the DoE are listed as a unit amount. Outputs made by the institution may take the form of publications in journals, conference proceedings or any other accredited literature, written by academic staff members. Each publication receives a unit output on a weighted scale.

A normative total of research output for the institution is then calculated. This normative total is based on the institution's total of permanently appointed instruction/research staff for year *n*-2 and a set of benchmarks which are approved on a three-year rolling basis by the Minister of Education. The ratio of weighted publication unit to

permanently appointed instruction/research staff 2004/5 to 2006/7 is 1.25.

Suppose that the result of passing any institution's total of research graduates and publication units for year *n*-2 through the grid in Table 4.1. is an actual weighted research output total **f**. And that the normative total of weighted research outputs (generated by applying the benchmarks of 1.25 to the same institution's total of permanently appointed instruction/research staff for year *n*-2) is **g.** And that the sum of all weighted **normative** research outputs for the system (Σ**g)** = **G**. If the sum allocated in the national budget for research outputs = **Q**, then any institution's research output grant **r** will be the proportion its **actua**l total of weighted output units has of the weighted **normative** total for the system, multiplied by the total amount allocated for research outputs in the national budget. The formal representation of these calculations is:

$$\mathbf{r = [f/G] * Q}$$

Since the introduction of the NFF, a gradual increase in the sum allocated in the national budget for research output (**Q**) has been recorded, for example from 857 933 (R'000) in 2004 for the 2002 reporting year to 1 236 836 in 2007 for the 2005 reporting year. In terms of the *Policy and Procedures for Measurement of Research Output of Public Higher Education Institutions in South Africa, 2003*, the DoE establishes for each reporting year, an evaluation panel of senior professionals from the higher education community to evaluate the research output submitted in the form of journal articles, books and conference proceedings of the claiming institutions. This is done in line with the peer review system.

(d) Research development grants

As far as research development grants are concerned, the Ministry of Education (2003:12) explains that if an institution's actual (weighted) total of research outputs is less than its normative total, then it will be eligible for a research development grant. The Ministry of Education (*ibid.*) goes on to explain that the amount of the grant for which an institution is eligible will be determined in the following way:

> *A calculation will be made, using only institutions whose actual totals are less than their normative totals, of a total of research output shortfalls. The research development grant for which an institution is eligible will be the proportion of its shortfall between normative and actual totals representative of the above shortfall total for the system, multiplied by the "surplus" on research output grant allocations (Ministry of Education, 2003:12).*

However, it should be noted that research development grants are not awarded automatically to higher education institutions. Institutions will have to submit formal applications for the amounts for which they are eligible to receive.

4.6.3.3. Institutional Factor Grants

Unlike the former funding framework, which provided for institutional set-up subsidies that compensated institutions for basic running costs without considering the size of its student population, the new funding framework does not contain such provision for research since it acknowledges the principle that government's funding to higher education is for the purposes of delivering research and teaching related services, and not for defraying costs (Ministry of Education, 2003:3.4). In its set of priorities, contained in the National Plan for Higher Education, the Ministry of

Education (2001:35) has highlighted the need to increase the participation, success and graduation rates (postgraduate level) of black students in general and African and Coloured students in particular.

In response to the National Plan for Higher Education, the NFF caters for grants for institutions with large proportions of disadvantaged students. The Ministry of Education (2003:16) states that for the purposes of this grant, disadvantaged students are deemed to be African and Coloured students who are South African citizens, and who are enrolled in either (a) contact education programmes or (b) distance education programmes offered by the dedicated distance education institution. For funding year *n*, calculations are made for each institution of the proportion which African and Coloured students who are South African citizens have of their total un-weighted FTE contact student enrolment in year *n-2*.

Calculations are also made for the dedicated distance education institution of the proportion which African and Coloured students who are South African citizens have of its total un-weighted FTE student enrolment (*ibid*.). As a consequence, institutions might start playing the enrolment game with the goal of just increasing their enrolment numbers of the disadvantaged students, irrespective of them having obtained university entrance in their matriculation results. In this case, the problem of a high drop-out rate at first year level will persist.

Institutional factor grants also include grants related to the size of institutions. These size factors according to the Ministry of Education (2003:17) takes account of economies of scale as the FTE enrolment size of an institution. The institutional size factor operates by giving additional teaching input grants to small institutions, depending on the size of their FTE student enrolments. Table 4.2. below, serves to illustrate

the examples of the additional amounts generated for small institutions by the size factor.

Table 4.2. Additional amounts for small institutions by size factor

Institutional factor grants for institutional size	
Total FTE student enrolment: contact plus distance	**Additional amount added to teaching input grant**
4 000 and less	15%
6 000	13.6%
8 000	12.1%
10 000	10.7%
12 000	9.3%
14 000	7.9%
16 000	5.4%
18 000	5.0%
20 000	3.6%
22 000	2.1%
25 000 and more	0

Source: Ministry of Education (2004:17)

The Ministry of Education stresses that the size factor operates as a linear and not a step function. The factor for an institution for example, with 7 000 FTE would be 12.9% and for the one with 17 000 would then be 5.7%. From the above background on the NFF, it is imperative to provide a critical analysis of the current policy instrument used to measure research output of HEIs. Moreover, research output forms the

basis of this study in the quest of highlighting the effects that the current policy has on HEIs knowledge production. It is thus crucial to determine how the DoE evaluates each category of the research output.

4.7. Evaluation of the research output by the DoE

Every year, Higher Education Institutions in South Africa submit their research output claims to DoE for subsidy purposes. A benchmark of 1.25 publication units (a journal article or equivalent represents one unit, as does a masters' dissertation completed within the minimum period; a doctoral thesis represents three units) per year is set per permanent full-time academic at a higher education institution. (See Section 4.6.3.2. "Categories of the new grants to higher education institutions").

In terms of books and chapters in books, Campanario (1998:182) explains that the peer review process involves reviewers assessing the soundness of a manuscript's ideas and results, its methodological and conceptual viewpoint, its quality, and its potential impact on the world of science. Again, the policy for the measurement of research output stipulates that, "the independent panel evaluates books and proceedings together with the relevant accompanying information individually prior to recommending the allocation of units for each book or proceeding". Genevieve Simpson (personal communication, October 29 2010)[48] explains that "accompanying information refers to two independent assessments that have to be carried out by peers of the authors of the book. Furthermore, the use of an independent panel of evaluators for books and conference proceedings helps to sift out submissions that are of no significance to the research community." It should be noted that the DoE does not recognise textbooks and conference programmes as research output. As such, the panel of

[48] Dr Genevieve Simpson is the Director in the Department of Higher Education and Training.

evaluators serve to determine submissions that qualify for subsidy in terms of the DoE criteria. Points are then calculated to determine the units to be allocated for subsidising evaluated books and chapters in books.

4.7.1. Calculating points for subsidising books and chapters

The DoE criteria stipulates that books qualify for a maximum of 5 points and are subsidised from 60 to 300 pages per book or monograph. This means that books exceeding 300 pages, for example, those that have 500 pages only qualify to be subidised for 300 pages and a maximum of 5 points. For a 60 page book/monograph only 1 unit will be allocated. A book of 180 pages will yields 3 points. In cases where a 180 page book is authored by 3 persons of which 2 are from the same institution, the division will be 3/2 = 1.5 units. In the case of chapters in books, the maximum pages per chapter being subsidized in 30 and each chapter accounts for ½ a unit. For a chapter co-authored by two persons, each author qualifies for 0.25 units. The maximum points allocated for chapters in books is also 5 units.

4.7.2. Points allocated to articles published in accredited journals

Each journal article qualifies for 1 unit subsidy. A research article published in an approved journal is subsidised as a single unit (1 unit), if all the authors are affiliated to the claiming institution. In the case where authors are affiliated with two or more institutions, the subsidy is shared between the claiming institutions. In other words, in cases where an articles is published by 5 authors of which 1 author is from a different university, that university gets 1/5 which equals 0.2 units. The university at which the remaining 4 authors are affiliated will in this case receive 0.8 points for that article. The author affiliations play a pivotal role in the allocation of points for published articles. As such, authors have to ensure that their affiliations are correctly stated prior to their articles being published.

4.7.3. Points allocated to published conference proceedings

Each paper appearing in published conference proceedings qualifies for 0.5 units subsidy. The points are also allocated in accordance with the affiliations of authors. As an example, in a case where a paper is authored by 3 person of which 2 are affiliated with the University of South Africa and 1 with the University of Cape Town, the University of Capet Town will get 1/0.5 units which equals to 0.25. Genevieve Simpson (personal communication, October 29 2010) cautions that a conference paper is counted once only, even if it is published in more than one format. That is, if a conference paper is also published as a journal article or a book chapter, it will still be counted once. HESA (2005:8) stresses that in a case where conference proceedings are published in a special or a normal issue of a journal, the output should be treated as a journal article, provided that the peer-review process has been followed. A discussion of how the DoE calculates the research output of HEIs leads to the need to determine the strengths and weaknesses of the two funding regimes.

4.8. Walking through the two funding regimes

In outlining the historical background of the South African higher education funding framework, it is apparent that fundamental differences are prevalent between the previous funding systems and the current policy. It is, therefore, necessary to start by identifying some major shortcomings of the SAPSE funding framework before discussing the not so recent systems used to fund the universities and technikons.

4.8.1. Shortfalls of the SAPSE funding framework

While the government certainly embraced the global efficiency agenda, the SAPSE funding instrument did not result in greater research output, or improved throughputs (Cloete, 2002(a):433). Several authors (Bawa and Mouton, 2002; Bunting, 1994; 2001; 2002; Jinabhai, 2003; Madue, 2006; Stumpt, 2001) agree that the SAPSE formula was a flawed funding instrument designed to benefit the Historically White Institutions (HWIs) while the Historically Black Institutions (HBIs). They argue that the SAPSE formula was not designed for, nor did it favour, the historically black institutions. The formula favoured established, well functioning institutions over smaller, less efficient and rural institutions.

In the same breath, Wolpe (1995:280) writes that research production in South Africa has been powerfully conditioned by the broader social and structural inequalities of South African society, with the result that it has a particular race and gender character – the virtual monopoly of white males. However, there is also an institutional dimension to research production: within the university sector it is overwhelmingly located in the HWIs (*ibid*.). The implication is that the SAPSE formula served to benefit HWIs which were well-resourced, while the HBIs which were under-resourced and financially struggling were not considered, hence the “blind” component. This system of excluding the HBIs from the SAPSE funding formula has widened the funding gap between the HWIs and HBIs, instead of bringing parity.

Cloete (2002(a):440) posits that although the SAPSE funding formula could be mechanically administered, it was not a neutral system because it was driven by student numbers, paid more for students in certain fields of study, and rewarded higher throughput rates and research output. A consequence of the SAPSE funding formula being driven by student numbers is according

to Jinabhai (2003:55) some institutions played the numbers game, by doubling student intake[49] only to discover later the ramifications of other part of the formula which was largely dependent on subject pass norms.

The Department of National Education (1982) acknowledges that the SAPSE formula was highly complex and only catered for historically white universities. This had to be corrected. The former funding framework which came into being in 1982/83 was not suitable as a steering mechanism in meeting the policy goals and objectives of transforming the system of higher education in South Africa, especially since it was based on a market model and cost driven (DoE, 1997(b):3). Steering mechanisms are policy tools that encourage higher education institutions to take certain steps that are deemed essential to national economic, social, or other goals. The "mechanisms" are typically some type of funding device designed to encourage or "steer" the institutions towards a specific goal or goals (Merisotis and Gilleland, 2000:8). CHET (2004:9) adds that from an international perspective, steering mechanisms are policy-driven funding priorities that occur both through base and non-base funding. They have been used increasingly by nations and states to achieve specific national policy objectives (*ibid.*).

The Ministry of Education (2003:2) argues that, the old framework (the SAPSE formula) does not contain mechanisms which a government can use to steer a higher education system towards the achievement of national transformation goals. The length of time which this framework has been in place is also a problem. International experience suggests that higher education institutions are able to manipulate a funding framework to their own advantage if it remains in place for too a long period. This has clearly occurred in South Africa over the 20 years of operation of this model (*ibid*.).

[49] Jinabhai (2003) continues to state that this in turn had a further cascading effect on institutional finances for additional infrastructural requirements and the woes continued with the economically disadvantaged students' inability to pay fees.

The SAPSE funding framework has according to Bunting (2002:132) explicitly rejected the principles of equity and redress,[50] holding that it was not the business of the higher education system to deal with social inequalities which affected either individuals or institutions. Bunting (2002:143) continues to state that it became generally accepted that the SAPSE framework was essentially an apartheid funding framework and could not be used in a transformed higher education system committed to equity and to strong linkages with national development needs.

4.8.2. Weaknesses of the Information Survey Manuals

The previous policies under discussion, that is, the *Information Survey Manual - Research Output of Universities (Report 014/97)*, and the *Information Survey Manual – Research Output of Technikons (Report 024/97),* as funding frameworks, have their origin in the apartheid era. Their predecessors were introduced in 1982-1983 where increasing attention of research was paid to the importance of meeting social and economic demands and policy became more oriented towards supporting research and development to these demands- the so-called "*demand-pull*" perspective. Apart from their origin in the apartheid past, the policies could not be used as steering mechanisms to address current national goals and objectives (Madue, 2006:14).

In the context of the declining outputs, the Ministry of Education (2003) acknowledges the concerns raised by HEIs and researchers about the weaknesses and limitations of the policy and procedures to measure research output as detailed in *Report 014/97* for funding universities and *Report 024/97* for funding technikons. These include the lack of recognition given to certain types of publication outputs such as technical reports and

[50] Also see Bunting (2002) for a detailed discussion on the first objections to the SAPSE formula, in which he has categorised the objections into (a) access equity; (b) efficiency and autonomy; and (c) unintended consequences.

policy reports; insufficient acknowledgement of the distinctive character of research at technikons; bias against certain disciplines in the arts and humanities in that the system does not recognise all forms of creative output, such as music, drama, etc.; and outdated list of accredited journals; and lack of response to the development of new knowledge systems and new modes of knowledge production.

In stressing the second area of concern, namely; the differential treatment of universities and technikons, the Ministry of Education (2003) illustrates that, although research funding is an integral component of the subsidy for universities (but not for technikons), comprising 15% of the subsidy, 65% of research outputs, which are recognised for subsidy purposes are produced by only six universities. Furthermore, the six universities are also responsible for producing about 70% of all masters' and doctoral graduates (*ibid*.). While acknowledging the weaknesses of the SAPSE formulas and the Information Survey manuals, the system has at least been relied on in funding higher education institutions in South Africa.

In closing his analysis of the SAPSE formula, Steyn (2002:268) writes that, although far from perfect, especially in a rapidly changing environment, the SAPSE formula has done its bit in the safe navigation of the higher education system through the dangerous waters of political democratisation during the 1990s. Its life was extended from year to year because of a lack of something better, he concludes. It is for this reason that the new policy came into being and is now embraced.

4.9. About the new funding framework

In South Africa, steering is a central component of the new higher education policy and is a deliberate alternative to the policies of the previous

government, which oscillated between almost total autonomy and state intervention (Merisotis and Gilleland, 2000:11). Policy-driven steering mechanisms can be used as devices to increase movement toward national goals as described in the 1997 White paper and in national planning discussions (*ibid*.14). The WP3 stipulates one of its goals as:

> *To contribute to the advancement of all forms of knowledge and scholarship, and in particular address the diverse problems and demands of the local, national, southern African and African contexts, and uphold rigorous standards of academic quality (DoE, 1997(c):1.14).*

In support of the WP3, the Ministry of Education (2001) states its strategic objective for sustaining and promoting research as:

> *To sustain current research strengths and to promote the kinds of research and other knowledge outputs required to meet national development needs, and which will enable the country to become competitive in a new global context (Ministry of Education, 2001:70).*

In order to realise its above stated objectives, the National Plan listed its priorities that include among others to: (a) increase outputs of postgraduates, particular masters' and doctoral graduates;[51] (b) increase research outputs; (c) sustain existing research capacity and strengths, and to create new centres of excellence[52] and niche areas in institutions where there is demonstrable research capacity or potential; (d) facilitate collaboration and partnerships, especially at the regional level, in research and postgraduate training; and (e) promote articulation between different

[51] The NRF is seen as the important driver of this priority, through its funding projects that include among others: free standing scholarships for masters' and doctoral studies both locally and abroad; joint funding with the Department of Labour in the category of scarce skills bursaries; and the research capacity building programme known as the Thuthuka Funding Programme.

[52] Through the collaboration of the NRF and the Department of Science and Technology, centres of excellence are created and funded, and established at various universities across the country. Recently, a centre of excellence was established at the University of South Africa and is led by Prof Odora-Hoopers.

elements of the research system with a view to developing a national research strategy linked to the national system of innovation.

The CHE (2005:4) asserts that in the South African context where for decades research production and postgraduate education merely reproduced the apartheid system, the management of research now requires the ability to make the connections between research output and the social, economic and cultural needs of a developing democracy and to create mechanisms of support for building new generations of black and women scientists in all domains of science. This system of concentrating on the production of research output is referred to as an output orientated model.

In the quest of highlighting these concerns, the Council on Higher Education (CHE) conducted a survey of the South African higher education sector in the 1990s. According to the CHE (2004:108), with respect to the higher education sector specifically, studies in the early 1990s revealed that:

a) Research and Development (R&D) was undertaken by South African HEIs in relatively equal shares with government and industry;
b) HEIs received about 40% of state expenditure on R&D – which totalled around 0.8% of gross domestic product (GDP) between 1989 and 1994;
c) Funding of research was directly allocated to universities through the Department of National Education on the basis of numbers of students and research publications with different weightings for the natural and human sciences (technikons did not receive direct research funding at first). In effect, some research funds were allocated “blindly” in that there were no measures to ensure that the 15% of subsidy funding allocated to universities for research infrastructure was in fact used for research purposes. Research funding was also indirectly allocated via contracts from government departments and science councils.

d) South Africa was undertaking approximately 0.5% of the world's scientific research in 1994, with the balance of output favouring social sciences and humanities rather than natural sciences. Universities performed 98.7% (by expenditure) of academic research – with the balance of expenditure by technikons. While universities produced 70% of South African indexed research publications, nearly 80% of these were concentrated in five institutions (Cape Town, Natal, Pretoria, Stellenbosch, and Witwatersrand).
e) Despite awareness of the need to shift resources towards the science, engineering and technology (SET) fields, there appeared to be a lack of adequate discrimination regarding funding across disciplines; this was consistent with the absence of central direction as to academic research output. Thus for example, South African universities were spending only one third as much as their international counterparts on engineering research (5% compared to 15%) and almost twice as much as other countries on the social sciences, arts and humanities.

It was against the above background that the NFF was developed after widespread consultation with the higher education sector. In embracing the NFF, Pillay (2003:2) elaborates that the new model's view on prices is radically different from that of the old model. In a sense, government first decides on how much it can afford to spend on higher education and then allocates the funds according to its needs and priorities. It would be possible to determine the underlying unit costs for the activities, but, within this new framework, the government's starting point for the allocation routine is not computed unit costs. For the operation of the model, the old prices and costs are not the "frontline matters for discussion". Compared to the old system, the NFF affords the institutions have the freedom to design their activities in line with available funds.

However, having said that, the NFF also has its share of criticisms. A major criticism of the NFF is that it favours researchers whose field of study is

conducive for producing multiple research papers per annum in comparison with those whose discipline prompts them to publish one or two articles per annum or those who concentrate on publishing important policy documents that generate no subsidy. The argument here is that researchers' productivity differs and varies according to fields. Another criticism levelled against the NFF is that focusing on outputs, especially with respect to research, the system tends to encourage institutions that have good research output, and affects adversely institutions with poor research output.

HEIs play a vital role in addressing the country's social and economic development. The contribution of HEIs is done through extensive social research projects, the production and patenting of new knowledge and other creative output. In order to enhance the economic development of a country, innovation in terms of patents and artefacts has to be recognised.

4.9.1. Recognition of Patents and Artefacts

Patents are public documents to describe and protect a technological invention (product or process). Nieto and Quevedo (2005) explain patents as documents providing legal protection of inventions and are the outcome of a complex process involving a dedication of a large volume of resources, including intellectual, technical etc; by research institutions to carry innovative activities. Davis (1997:127) stresses that patents protect ideas as they are put into practice as machines, manufacture, processes, or composition. Economically, patents provide monopoly rights to an invention in return for publicly disclosing the invention. The CHE (2005:14) concludes that patents are documents issued by a government office, that describe an invention and create a legal situation in which the patented invention can normally be exploited (made, used, sold, and imported) only by or with the authorisation of the patentee.

As far as the artefacts, designs and creative works are concerned, the CHE (2005:15) explains that these include non-textual outputs (images, performances, artefacts, designs) that result from original, systematic investigation undertaken in order to gain new knowledge and understanding and which lead to new or substantially improved insights. A fundamental difference between previous policies and the current policy is, previous policies have recognised Patents and Artefacts[53] as research outputs, while the current policy does not make mention of patents and artefacts as categories of research output. In this case, institutions stand out to miss out on potential earnings of substantial amounts which in the previous policies were originally generated through patents and artefacts. That is, in the *Information Survey Manual (Report 014/97:9)*, it is stated that, "patents that were granted during the reporting year and which fulfil the requirements, are allocated two units if all the inventors were affiliated with the same technikon or university" and for artefacts, "a particular artefact can earn a maximum of two units where it is evidently new technology".

In view of the non-recognition of patents and artefacts, the new policy is not user friendly when compared with its predecessors. HEIs, particularly the universities of technology (formerly technikons) place a high premium on patents and artefacts in a quest to foster innovation among its researchers and students. In this regard, other forms of research outputs such as articles and books might take precedence over patents and artefacts even though patents generated more money for HEIs per unit than any form of research output. Commenting on the Peer Review of Creative Work, the University of the Witwatersrand (2009) states that, a major contradiction in the approaches taken by the respective entities governing South African policies regarding research is that whereas scholars working in the creative arts can be rated by the National Research Foundation as researchers, the work for which they receive such ratings is not formally considered a research output by the Department of Education.

[53] Artefacts are defined as man-made objects or inventions that could be classified or recognized as research output in terms of the DoE for subsidy purposes.

Together with other HEIs worldwide, the South African universities of technology have recognised the importance of not only generating new technology through research and development programmes, but also actively participating in applying and utilising knowledge and technology for new products, processes and services. Apart from patents and artefacts, other forms of research output such as electronic publications were not promoted by the previous policies. No mention of electronic publications is made and catered for in the previous policies.

4.9.2. Electronic publications

The avenues of scientific communication are rapidly expanding. The internet, e-mail, online databases, and on-line journals are some of the new developments that are changing the sphere of research development, communication, knowledge production and dissemination (Teferra, 2003:4). It is from this perspective that Van Raan (2004:28) asserts that journal publications are challenged as the "*gold standard*"[54] in science as the worldwide web has changed scientific communication. Researchers use the web for information seeking, and in addition to the above mentioned "not-Citation Index covered publications" there is an enormous number of further publications and data included in institutional and personal websites (*ibid*.). During the past few decades, more and more scholarly documents have become available in electronic form and stored in electronic archives.

According to Moed (2005:313), electronic archives may contain either peer reviewed or non-peer reviewed documents. They may even include a non-refereed reprint version and a final, accepted, and possibly revised version of the "same" document. Moreover, electronic publications may offer open or toll access.[55] Bruns[56] (2008:4) explains that the phrase "open access"

[54] Moed *et al.*, (2004:35) also arrived at the same conclusion.
[55] Open access allows anyone, anywhere, with a connection to the Internet to read, download, print, copy and redistribute any deposited article. Toll access means that only subscribers paying subscription fees are permitted to use an archive. The

broadly refers to an idea that sprung from a meeting sponsored by the Open Society Institute in Budapest in 2001: that new research in all fields should be available online and free of charge. However, Egger and Carpi (2009:5) argues that access to the vast majority of journals, even digital journals, is limited by subscription, which may run into thousands of dollars.

A distinguishing characteristic of the current framework is that, the framework has also taken into consideration of the changing modes of disseminating research output, such as electronic publications[57] and further outlines processes and procedures that are appropriate to the purpose and commensurate with best practice while previous policies only considered the use of hard copies. ASSAf (2006:86) reports that twenty-first century researchers will likely expect to find their journals online and many young people already subscribe to the idea that *if it's not on the internet, it might just as well not exist*.

A study by ASSAf (2006:90) revealed that on 16 September 2005 there were 1763 journals listed in the Directory of Open Access Journals[58] (http://www.doaj.org/), of which 439 were searchable at article level. Whereas the current policy has taken into consideration the technological developments in the dissemination of research output as in electronic publications, the previous policies only considered submissions made in hard copy format.

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term Open Access encompasses a specific online publication business model as well as a range of channels for making research literature available to everybody at no cost. It is based on the philosophy that the research literature, which is not written for profit but for the advancement of science and which is largely funded by public money, is a public good and should be accessible to everyone who has a need for the information.

[56] Karen Bruns is the marketing manager of the Human Sciences Research Council (HSRC) press and the chairperson of the academic committee of the Publisher's Association of South Africa.

[57] In the past years publishers of scientific and scholarly information have made their journals and articles available through the Internet to universities, corporations and government institutes. See Moed (2005:313).

[58] They include 77757 articles. Other OA journals are listed under free full-text journals on the Japan Science and Technology Information Aggregator, Electronic (J-STAGE) site at Meiji University Library Online (SciELO) project.

In keeping with the technological developments, the DoE issues on/or before 31 January of each calendar year, an official list of approved journals for each reporting year on its web site http://www.education.gov.za. Currently, 197 South Africa journals are appearing on the DoE list. According to the Ministry of Education (2003:4), research output published electronically may be recognised if they meet specified criteria. In comparing the current policy with its predecessors, it is worth noting that there is also a great procedural difference in the consideration of journal research output.

4.9.3. Recognition of articles published in Research Journals

According to pragmatic rules of the subsidy game (in which institutions receive cash payments from the government in return for publications on a growing but still inadequate list of accredited journals), the unit of currency is the individual scholarly article, generally ranging in length from about 5000 to 8000 words (Higgins, 2008:2). According to the imperatives of this system, scholarly repute in the institution's eyes (and a large measure of consequent self-regard on the part of the academic) is largely quantitative and is measured in terms of journal articles published. The research output categorised as journal articles refers to peer-reviewed[59] periodical publications devoted to disseminating original research and new development consisting of a substantial work of scholarship within specific disciplines or field of study. The journal, which must be published regularly, must have an International Standard Serial Number (ISSN) or International Standard Book Number (ISBN). The previous research policies had only one list (the Index of the Institute of Scientific Information) of approved journals that were considered for subsidy purposes.[60]

[59] Peer review is the benchmark by which quality is determined, and it is in this venue that we can build academic community — a place where we can be helpful to one another.
[60] Also see footnote 3 for the approved DoE list.

According to ASSAf (2006:30), this entailed that articles published by South African academics (with an address at a university or technikon) in any of the accredited journals as stipulated by the then Department of National Education would qualify for a subsidy to be determined each year as part of the "block subsidy" granted to each of the public higher education institutions. The original list of accredited journals was compiled by including all ISI-journals, and adding South African journals to an "Accredited List".[61] The new policy has five separate lists. The consequences being that it is cumbersome to use five lists that are continually updated and could not be entirely relied upon when compared to the use of a single list.

It is argued by some cynics that most papers appearing in the huge research literature are in any case written to be published rather than to be read with enthusiasm, since only a small minority is cited in respectable journals. In arguing against the use of citations, Melck (1982:61-62) states that the imperfections of the method include those arising from biased citations, for example when an author wishes to win the favour of a colleague, air his own achievements through self citations, destroy the arguments of an academic adversary and so forth.

Melck continues to argue that of greater significance may be the fact that an author (or university department) may accumulate many citations by publishing a great number of relatively trivial articles, each of which is cited, say, only once, whereas another may publish less, but because of the fundamental nature of each contribution is cited many times. In practice, the argument is that the role of high-impact foreign journals in South African academe is seen as providing the quality and kudos that grow a scientist's reputation, whereas the role of "local" journals, suitably "accredited", provides little more than an outlet for subsidy-earning articles (Pouris,

[61] Due to regular submissions of successful proposals for additions of new journals, the list of accredited South African Journals grew to 210 by the end of 1997.

2004:508). There are just a few South African journals (about 20) appearing in the international Thomson ISI lists.[62]

There are currently at least 255 South African scientific or scholarly journals recognised by the DoE as meeting the minimum requirements for state subsidy under the policy of supply-side support for authors (and their institutions) who publish in these journals. Twenty-three of these journals appear in one of the ISI Citation Indexes, 14 are indexed in the International Bibliography of Social Sciences (2 journals appear in both), while the remaining 220 journals are "accredited" separately by the Department (2003 list and 2004 supplementary list) (ASSAf, 2006:29).

The new *Policy for the measurement of research output of public HEIs in South Africa*, *2003*, states that, for purposes of subsidy, only qualifying journals in the following categories are recognised:

(a) Journals appearing in the following international indices are included in the list of approved journals; (i) The Sciences Citation Index[63] of the Institute of Scientific Information (ISI); (ii) The Social Sciences Citation Index of the ISI; (iii) The Arts and Humanities Citation Index of the ISI; (iv) The International Bibliography of Social Sciences (IBSS); and (v) The Department of Education (DoE) List of Approved South African Journals.

(b) South African journals not appearing in the above indices, but whose seat of publication is in South Africa and which meet the DoE minimum criteria are also included in the list of approved journals. These journals are included in a separate index of Approved South African Journals maintained by the Department of Education (DoE) and subject to an annual review (Ministry of Education 2003: 5-6). The criteria that these journals had to meet in order to be accredited by the DoE were the

[62] Pouris (2004) has done a study of the South African journals appearing in the ISI lists, as well as their citation thereof. Literature on the performance of South African journals in comparison with other countries is very limited.
[63] The Science Citation Index (SCI) covers several thousands of journals from literally every scientific discipline.

following: (i) The required purpose of the journal is to disseminate research results, and the content has to support high-level learning, teaching and research in the subject area concerned; (ii) The journal requires an ISSN (International Standard Serial Number); (iii) The journal has to published regularly (frequency of publication); (iv) The journal requires an editorial board that is reflective of expertise in the subject area covered; (v) The members of the editorial board are required to have standing in their respective subject areas in terms of their own peer-reviewed research, through their publications and citations; (vi) Articles accepted for publication in the journal require to be peer-reviewed; and (vii) The journal requires to be distributed beyond a single institution (holdings of South African and/or international Libraries were taken as the standard against which this criterion was measured) (ASSAf, 2006:29).

The list of approved South African Journals (excluding the ISI-listed titles) that was appended to the new policy numbered 197. A supplementary List, containing the names of a further 23 South African journals titles, was added in 2004. This brought the total of South African journals titles (still excluding those on the ISI-list) accredited by the DoE to 220 journal titles. For the 2004 audit to be submitted in 2005, the DoE has indicated that HEIs should use the ISI Science Citation Index that contains only 3370 journals. On the ISI website, there is also the ISI Science Citation Index Expanded that lists 6375 journals. A comparison of the two ISI journal lists clearly shows a difference of 3005 journals, which means that HEIs were to loose on their subsidy earnings if the DoE will not consider the use of the ISI Expanded list.

There are numerous perceptions regarding the quality of the South African Journals appearing on the ISI-indexes. ASSAf (2006:29) reports that many perceptions about the quality or lack thereof of South African journals remain, and include these questions:

a) Are the South African journals in the ISI-indexes automatically superior compared to those who are not? If this is the case, would it imply that the vast majority of the humanities and social sciences – which are not indexed in the ISI – are to be regarded as being of inferior quality? Does it mean that those South African journals that at some point in time were included in the ISI lists but were subsequently removed from them (e.g. the South African Statistical Journal), should now be regarded as inferior?

b) Are all journals not included in the ISI-indexes of similar (accreditable) quality? Technically, they are viewed as such, since the DoE retained most of them on their revised list dated September 2003. How do we establish whether the 220 non-ISI and non-IBSS South African journals are all of "adequate" quality?

c) Has the DoE scheme not led to a compromise in quality anyway? Any article - irrespective of length or content – which appears in any of these lists, qualifies for subsidy. Many commentators have viewed this as a recipe for lowering the standards of these journals. In fact, there are many cases (e.g. the *South African Journal of Higher Education*) where the number of articles per issue has escalated over the past few years – seemingly to meet the increasing demand for publication outlets. And since we do not have any reliable, audited data on the "success rates" (exemplified, by their frequent citation in more recent articles) of submitted articles to South African journals, it is impossible to establish whether the increase (in some cases) in the number of articles per issue has coincided with a decline in rejection rates.

In continuing the quality discourse, Jacobs (2000:1) is of the opinion that there is a relationship between the importance of the scientist and the logarithm of the number of papers he has published during his life. Prestige

is the driving force that prompts authors to publish in foreign journals (*ibid*.). Maluleke[64] (personal communication, April 18 2008) adds that:

> *… some foreign journals are playing the citation game whereby when an author's article is accepted for publication in a prestigious ISI listed journal, a provision is made that authors should quote from articles published in the previous issues of the same journal.*

Maluleke also brings in another dimension when he argues that the accreditation system of journals is also controversial. He argues that the process of accrediting journals is fairly reasonable but the process of removing journals from accreditations is rather difficult and cumbersome. According to Maluleke, the process or removing journals from the accreditation system is self refereeing whereby authors and editors are given the responsibility of writing to the DoE in request of such journals to be removed.

However, there are journals that do not appear in the ISI Science Citation Index which is said to be used by the DoE. This means that HEIs are set to loose on subsidy that was supposed to be generated through articles published in such journals. A research article published in an approved journal will be subsidised as a single unit (1 unit), if all the authors are affiliated to the claiming institution. In the case where authors are affiliated with two or more institutions, the subsidy is shared between the claiming institutions. Although research articles are highly acclaimed as the preferred measure to subsidise HEIs, books are also considered.

[64] Professor Tinyiko Maluleke is the Director of Research at the University of South Africa.

4.9.4. Books and chapters in books

Neither research methods nor tacit knowledge, nor technical artefacts can be communicated and transferred in full through research papers in refereed journals only. Books and chapters in books can be used to pinpoint important agents and actors in the transfer of knowledge and utilisation process of codified knowledge. Diamond and Graham (2000:29) emphasise that in social science disciplines such as history, publication typically takes the form of books rather than journal articles.

Books in this context refer to peer-reviewed, non-periodical scholarly or research publications disseminating original research on developments within specific disciplines, sub-disciplines or fields of study (HESA, 2005:04). The emphasis here is that the target audience must be specialists in the relevant field or discipline. The new policy states that to be included in this category the publication must meet all of the following requirements: (a) a major work of scholarship bound (or if in electronic format, such as a CD-ROM, packaged) and offered for sale; (b) has an International Standard Book Number (ISBN); (c) written entirely by a single author, or by joint authors who shared responsibility for the whole book (i.e. individual chapters are not attributed to different authors); (d) consists mainly of previously unpublished material, and made some substantial contribution to a defined area of knowledge; and (d) has been published by a recognised commercial press[65] or publisher.

[65] The DoE (1997(b)) defines a recognised commercial press or publisher as an entity for which the core business is producing books and distributing them for sale. For this purpose university and other self-supporting higher education institution presses are regarded as commercial publishers, provided that they have responsibility for the distribution of the publication and not only its printing. Unisa Press is an example of a recognised commercial press, since it is also among other activities responsible for publishing accredited journals such as *Politeia* and the *South African Journal of Higher Education*.

This include among others: (a) major monograph[66] i.e. a substantial body of research published as a monograph, which contains several substantial chapters and contains original thematic ideas. Length should generally exceed 60 pages; (b) minor research monograph - i.e. a body of research published as a monograph, which contains several substantial chapters. Length would be more than 60 but less than 100 pages (excluding references, bibliography, appendices); (c) Critical scholarly texts (for example music, medieval or classical texts); (d) new interpretations of historical events; and (e) new ideas or perspectives based on established research findings.

However, this category excludes among others: textbooks and study guides, edited books; creative works such as novels, which depend mainly upon the imagination of the author rather that upon a publicly accessible body of agreed fact (but an accompanying critical scholarly text may be referenced if it is a major work in its own right); books published by private individuals, university departments and centres and privately funded companies; dissertations and theses; and translations (unless incorporating a critical scholarly text which is a major work of scholarship in its own right). In support of the exclusion of some books in the subsidy system, Harnad (2003:1) argues that the author of a book or textbook writes in order to have the text sold for royalty income. It is for this reason that, only books for specialists that are written for professionals and were subjected to a review process are considered for subsidy purposes.

With regard to the procedure of submitting claims for books for specialists, there is only one notable difference brought about in the new policy. The new policy states that *in addition to the standard required information, each physical copy of the book must be accompanied by two independent*

[66] Contrary to this provision, Higgins (2008:2) argues that the current subsidy system has no place for the monograph – it earns nothing in terms of subsidy, though years of protest have resulted in a bizarre system of accreditation for monographs. This means they may finally yield the same as a single book article, but only after an off-putting and extremely arduous administrative process.

assessments (to be carried out by peers of the authors) of the book and contribution as a research output.

The report of the independent assessors must contain the following: (a) Name of institution; (b) name and institutional affiliation of the independent assessor (the assessor should be a peer of the author and should not be affiliated to the claiming institution); (c) the title of the book; (d) the authors of the contribution; and (d) the assessment of the book and contribution as a research output, with reference to the provided criteria for evaluation of books (DoE, 1997(b):9).

The previous policies did not require reports by independent assessors or peer review in the submission of claims for books. Apart from the use of five different lists of journals, the current policy has instituted the classification of research output by education subject matter.

4.9.5. Classification of Education Subject Matter

The current policy distinguishes itself from its predecessors in the sense that is has categorised research output in to the Classification of Education Subject Matter (CESM) categories. The CESM provides a single, coherent system for classifying subject matter regardless of the level of instruction, type of institution, or source of support and represents a necessary step toward the improvement of existing data collection, recording, and reporting procedures (Ministry of Education, 2001:1). Although the CESM was initiated in 1982, the implementation thereof was only done through the current policy as opposed to its predecessors.

The previous policies did not classify the submission of research output into specific subject matters. The current policy has made provision for

distinguishing research output according to first and second order CESM codes. As an example, code 07 refers to Education (encompassing all related fields of education such as foundations of education, systems of education, teaching subject matter, teaching – training, special education programmes and, educational evaluation and research). The provision renders the current policy more effective than its predecessors in that the capturing and retrieving of research information has become user friendly for both data capturers and individuals seeking information on specific research output.

A uniform terminology and structure provided by the CESM is highly essential in the collection and recording of data, which is the first step of the reporting process. The CESM as one of the fundamental differences between the previous policies and the current policy brings us to a consideration of the difference between "blind" funding and output-oriented funding. Having taken a walk through the two funding regimes in the subsidisation of HEIs in South Africa, it is important to identify the differences between blind funding or subsidy and output oriented funding.

4.10. Blind funding versus output-oriented funding

The blind component of the previous funding formula was based on the number of enrolled students. Blind funding (also referred to as "base formula funding") is heavily relying on formulas rather than the output of HEIs. Base formula funding according to CHET (2004:8) is funding provided by the government to continue the basic operation and maintenance of higher education institutions. Base funding is typically enrolment driven and provides operational stability. Base formula funding is largely full time enrolment (FTE) driven. By using the base formula, higher education institutions receive subsidy from the government on the basis of the number of subsidy students multiplied by various unit costs (Merisitos and Gilleland, 2000:29). Ishengoma (2002:5) explains that the number of subsidy students

and unit costs determine what is known as the "*government contribution factor"*.

According to the NCHE (1996:5), base formula funding takes one of the three forms. One form involves the transfer of resources to institutions based mainly on their teaching costs, which is not applicable to this thesis. A second form is based on actual average student costs typically differentiated by levels and field of study. A third form allocates funds on the basis of normative unit costs reflecting what the government's contribution to the costs for various fields should be. However, the "blind" subsidy has resulted in considerable challenges. In South Africa, the Ministry of Education (2003) acknowledges that the "blind" subsidy has resulted in the inefficient utilisation of resources as not all institutions use the allocated funds to support research.

Steyn (2002:254) writes that the calculation of the subsidy formula depends critically on student enrolments.[67] This type of funding is a blunt instrument, and can provide some level of steering. It has some advantages in that it is a fairly autonomous process that does not require significant administration or oversight. Using the analogy of a compass, the base funding steering mechanism can point the funding system in the direction of national policy goals, but usually they do not offer much precision (CHET, 2004:8).

A definition of a formula outlined by McKeown-Moak (1999:101) serves as an example in which he states:

> *A formula is a mathematical representation of the amount of resources or expenditures for an institution as a whole or a programme at the institution.*

[67] According to Steyn (2002:254), the suitability of a particular measure of student enrolment depends on the purpose for which the enrolment will be used. Steyn continues to differentiate on the different purposes for which student enrolment is used. For purposes of this study, mention is only made of the Effective subsidy students (ESS), as Steyn (*ibid*.) points that this way of counting students forms the basis for the application of the SAPSE formula.

The CHE (2004:56) posits that the "blind" component refers to the 15% allocated in the then funding formula for research infrastructure,[68] which was only available to the universities and not to the technikons. The CHE further recommends that there should no longer be a "blind" research funding component but research should be funded through earmarked funding which can also be blind.

With regard to the output-driven approach, McKeown-Moak (1999:104) posits that in place of input formulas, productivity measures and other accountability techniques are being used to measure institutional performance and allocate resources. In South Africa, the Government Gazette No. 25583 of 2003 providing a summary of the policy framework for funding research in higher education institutions states that the allocation of research funds to institutions must be determined on the basis of: (a) an actual weighted total of the research outputs produced by each institution; and (b) a normative weighted total of the research outputs which each institution should have produced, in accordance with benchmarks laid down by the Ministry of Education.

Since the introduction of the NFF in 2001, there has been a major change in government research funding from 12% "blind" funding of up to R20 000 for a published paper in a peer-reviewed journal which together resulted in approximately 15% of a university's subsidy component. The system is based on earned outputs, for example, published papers (R73 000 for a paper in a peer-reviewed journal) (Woods, 2005:4). Currently, Higgins (2008:2) points out that for each published journal article, universities receive about R85 000. Higgins goes on to explain that from the trickling down to the individual researcher in very different proportions (in one institution the author receives as much as R20 000; in another, as little as

[68] It should be noted that by "the then funding formula", the CHE is referring to the old system (*Report 014/97*) for universities and (Report 024/97) for technikons. The current system in this study refers to the new *policy for the measurement of research output of public higher education institutions in South Africa* which was implemented with effect from the year 2001.

R1 000 an article. Brynard (personal communication, March 18 2008)[69] shares the same opinion when he states:

> *Academics in various institutions share their experiences in a number of ways, this might partially explain the continuous floor crossing of academics in South African HEIs*.

However, on the one hand, the new system according to Woods (2005) promotes the pursuit of incremental research rather than groundbreaking research. On the other hand, for institutions that are less productive on research output, Deaton (2004:1) posits that as a consequence, institutions are increasing student fee charges, transferring an even larger portion of the total cost of education to students and parents away from the taxpayer funds.

In South Africa, steering mechanisms seem particularly important because of the "blind"' funding formula's failure to focus on the nation's new policy goals (CHET, 2004:10). In comparison with the new subsidy policy, the previous funding systems were not driven by the national goals or by the needs of the students, but were according to the CHET (*ibid*.) rather using enrolment-driven calculations to produce an institutional funding amount.

4.11. Findings emerging from the analysis of the two funding regimes

International experience suggests that higher education institutions are able to manipulate a funding framework to their own advantage if it remains in place for too a long period. For example, in the case of the Holloway formula, Steyn and De Villiers (2006:36) explain that problems arose in its application when the formula was exploited by some universities by

[69] Prof Petrus Brynard is the Research Information System Coordinator in the Faculty of Economic and Management Sciences at the University of Pretoria. He is also a Public Policy professor in the School of Public Management and Administration (SPMA) at the same university.

artificially subdividing academic courses in smaller units to receive a greater subsidy. Brynard (personal communication, March 18 2008) posits that:

> *… funding subsidy mechanisms are policy instruments which are subject to manipulation and misinterpretations. Reviewing of policy instruments should be done more frequently since HEIs will capitalise on their loopholes.*

The SAPSE funding formula as a policy instrument used for about 20 years in South Africa is no exception with regard to manipulation by the HEIs as a means of generating more income through subsidy, as Jinabhai (2003) points that some institutions played the numbers game by doubling student intake since the formula was student enrolment driven.

In comparison with the SAPSE funding system, the current funding policy affords the government to determine the number of subsidised student places, instead of allowing the decision to be made by HEIs with a higher probability of being manipulated. A difference of note is that with the current funding policy, the subsidy amount is determined once the government has decided on the funds available for the higher education sector. With the SAPSE system, HEIs could compare the ideal subsidy amount with what they actually received and use that information as a basis to lobby for additional funds.

The current funding policy subsidises HEIs through student throughput rates instead of the student enrolments plus throughput as was the case with the SAPSE funding formula. Institutions have to wait until their registered students complete their degree programmes before receiving the subsidy. The effect of the current policy might be, in view of the high student failure rates, some institutions might continue to manipulate the funding system by pushing students, thereby compromising the quality of graduates

released to the work environment. Consequently, this impacts negatively on the educational externalities has been discussed in Chapter 3.

Maluleke (personal communication, April 08 2008) also argues that smart institutions may come up with exclusion plans by declining enrolment applications of students with a higher probability of not completing their studies. Maluleke further points that in terms of student throughput rates, HBUs may not be able to compete with HWUs based on the historical discrepancies of resource allocations. Students enrolled at HBUs usually take a longer period to complete their studies when compared with those enrolled at HWUs.

While there is a significant improvement on the current subsidy policy when compared with its predecessors, earlier concerns raised by Melck in the 1980s regarding recognition of other forms of research, especially research that is not published, has still not enjoyed attention. According to Melck (1982:59) shortcomings include the omission of research that is not published, as may occur with some kinds of commissioned research but also with papers delivered at conferences and seminars and research which goes towards higher degrees, and the inclusion of some material which is not true research. The latter category includes text books and reviews. There may also be a measure of duplication in so far as the results of research may be published simultaneously in both a journal and a book (*ibid*.).

As just alluded to, another finding is that both funding regimes do not recognise textbooks, book reviews and editorials as research output. As far as book reviews are concerned, I have argued that in conducting a book review, the reviewer also conducts research in the form of an exploratory study and produces an output through publishing the findings of his/her book review. In terms of preference of journal articles to books in terms of

weight, Higgins (2008:2) argue that since university research administrations follow the money and structure research support around journal publication rather than monograph preparation, it is not surprising that the monograph is on its way out as a form of academic production in South Africa.

Although masters dissertations and doctoral theses are regarded as research contributions, they still do not yield the same subsidy amount as articles published in accredited journals or books. In this case, masters' and doctoral supervisors tend to encourage their students to at least publish articles emanating from their masters or doctoral research results. For subsidy purposes, this is usually done through co-publication of articles by supervisors and students.

With regard to the citations in ISI-indexes, the development of citation indices however good they may be, still have significant limitations. Journals of differing academic standing are often treated as equal. There is a need to illuminate the difference between established and less prestigious journals. Yet, although academics in the humanities argue that research articles are taking less time and effort to produce, in comparison with monographs and books, they yield more subsidy than books. For example, Higgins (2008:2) argues that the deep research that goes into monograph writing comes out at about 70 hours per 1 000 words, while 40 hours per 1 000 is about right for a strong scholarly article.[70] Again, an interesting and yet relevant finding is that, although for each published research article universities receive about R85 000 (See Section 4.9. "Blind funding versus output-oriented funding"), the amount received by the authors varies considerably across HEIs. The amounts range from R1 000 to R20 000 per published article.

[70] Higgins (2008) goes on to explain that this estimate takes into account all the reading and rereading of primary, secondary and related (historical and theoretical) material involved. But also, and perhaps more importantly, it takes into account the differing time of composition as key sentences and paragraphs have to be rewritten dozens of times in a drafting process, which involves five or more basic drafts.

While there are fundamental differences between the old funding formulas and the NFF, Pillay (2003:4) in embracing the NFF writes that the two central features of the new funding framework are as follows:

- **Teaching funds:** Teaching funds are based on teaching inputs and teaching outputs. In allocating teaching funds to institutions, the model treats all institutions (namely technikons – technical higher education institutions - and universities, equally).
- **Research funds:** Research funds are based on research output and on earmarked funds for specific developmental purposes. The new framework makes no separate provision for a "blind" research element or so-called "research input funds", that is, a subsidy amount which institutions will receive regardless of whether or not they engage in research activities**.** Research training is regarded as a sub-component of teaching and provision for research training has therefore been made within teaching funds.

In concluding the emergent findings, it is worth noting that the changing nature of higher education funding policies is a world phenomenon. Funding policies across the globe are more geared towards promoting a high quantity of research output. The consequence thereof might be, in pushing for more research output, the quality of such output may be greatly compromised. From the Australian perspective, which also holds true in the South African context, Hobson *et al*., (2005:358) conclude that the privileging of research over other strands of academic work in the current policy and funding environment promotes the "heroic" researcher – with a hundred publications and a million dollars in grant funding – as the kind of defining portrait of academic achievement.

Lastly, incentives offered by HEIs to the outstanding researchers in terms of the numbers of their published (subsidisable) research output have an

influence in the increase in knowledge production. The incentives are used to encourage the less productive researchers to compete with the productive researchers who tend to be regular recipients of research awards. Apart from competing with colleagues, publication in DoE accredited journals and scholarly books serves as an incentive since this also is used as the criterion by funding agencies such as the National Research Foundation for evaluation of researchers for purposes of rating and funding. The argument on the incentives offered by HEIs to researchers has levelled the playing field for this chapter. It is now time to close up the discussions and findings of this chapter by means of a synopsis of the entire chapter.

4.12. Conclusion

As the third pillar of this thesis, this chapter was started by defining research before discussing funding formulas as policy implementation tools to subsidise higher education institutions. From the definitions of research, the following deduction has been drawn:

> *A broad definition of research that is not narrowly scientific has to include all endeavours that add to society's creative outputs, self-reflection and understanding.*

This chapter on a comparative analysis of the two regimes has compared two sets of policies for subsidising research output of HEIs. As a point of departure for a comparative analysis, the chapter outlined an overview of the higher education funding policy framework that led to the enactment of the new policy and also highlighted the major differences between the current policy and the previous policies.

A major finding from the comparative analysis if that the development of the new funding policy for HEIs in South Africa was necessary as its predecessors which were introduced in the early 1980s could not be used to address the national goals and objectives. Jacobs (2000:2) reminds us that one of the legacies of the apartheid system was the discrepancy in funding and support for various activities, including research work in science and technology, based on racial grounds, some institutions of higher learning and research institutions were more favoured than others in terms of resources. In this regard the new policy is considered to be more effective than previous policies in that, it is a performance-related distributive mechanism that explicitly links the allocation of funds to academic activity and output, thereby positively contributing towards the HEIs efforts to assist the government in the economic and social development of the country.

From the analysis of the current and previous policies, it can be deduced that in line with the transformation agenda, the new policy has effectively contributed towards the creation of a single coordinated higher education system in South Africa as espoused in the *Higher Education Act of 1997*. Unlike its earlier predecessors, the new funding policy does not differentiate between universities and technikons. Previous policies have used different procedures for subsidising universities and technikons. The major differences between the current policy and the previous policies as discussed previously, can be used by HEIs to leverage their research output, improve their annual output production as the new policy improves the measurement of research output by among others recognising the move towards electronic publications.

Although the current policy is intended to encourage research productivity, it is not intended to measure all output but to recognise major types of research output produced by HEIs. The research output recognised by the DoE for susbsidisation of HEIs take the form of published articles

appearing in accredited journals, books for specialists and refereed conference proceedings. In terms of the journal articles, research has revealed that the DoE has recommended the use of the Science Citation Index of the Institute of Scientific Information (ISI) for the 2004 audit and onwards. The use of this index has proven problematic since it leaves out 3005 journals in which South African researchers publish their output. My recommendation to the DoE is to consider the use of the ISI Science Citation Index Expanded, which lists 6375 journals instead of the 3370 journals as listed by the ISI Science Citation Index.

Finally, seven major effects of the higher education funding policies have been identified as:

(a) In Section 4.9. above ("Blind versus output-oriented funding"), it was reported that the NFF is perceived to be promoting the pursuit of incremental research and rather than groundbreaking research.

(b) In view of the lower income generated through research output, institutions might significantly increase student fee charges, thereby transferring an even larger portion of the total cost of education to students and parents away from the taxpayer funds, as indicated in Section 4.9. ("Blind versus output-oriented funding") above.

(c) Again, in terms of considering the new funding formula's approach of funding institutions for student throughput rates, smart institutions may come up with exclusion plans by declining enrolment applications of students with a higher probability of not completing their studies. (Section 4.9. "Blind versus output-driven funding").

(d) Furthermore, in view of the high student failure rates, some HEIs might continue to manipulate the funding system by pushing students through, thereby compromising the quality of graduates released to the work environment. (Section 4.10. "Findings emerging from the analysis of the two funding regimes").

(e) In terms of student throughput rates, HBUs may not be able to compete with HWUs based on the historical discrepancies of resource allocations. Students enrolled at HBUs usually take a longer period to complete their studies when compared with those enrolled at HWUs (Section 4.10. “Findings emerging from the analysis of the two funding regimes”).

(f) Research administrations will adopt policies that push up the quantity of research production and not addressing the issue of labour time involved in quality production. In stressing this effect, Higgins (2008:2) is of the opinion that since monograph preparation would take a minimum of two full years devoted entirely to research and writing (that’s the reason beginning academics are supposed to be given three unencumbered years to write and research their doctorates), administrations press for the average production of one article a year from each average academic.

In conclusion, in the words of Harnad (2003:1) researchers are encouraged, indeed required, to publish their findings because that is the only way to make their research accessible to and use by other researchers. It is the only way for research to generate further research. In the next chapter, the study argues that the NFF has had positive effects on the knowledge production of South African HEIs. In attempting to confirm the hypothesis of this study, Chapter 5, as the forth pillar of this thesis, will map out the research output trends of South African HEIs before and after the introduction of the NFF.

Chapter 5

Roofing – higher education research output trends

Research is a university's national and international passport. Other institutions will collaborate with you provided that you have something to offer – David Woods 2005[71]

5.1. Introduction

My previous work (Madue, 2006; 2007) focused on how one institution and its faculties responded to the new *policy for the measurement of research output of public higher education institutions in South Africa*. Again, Chapter 4 of this thesis has dealt with a comparative analysis of the current higher education research funding subsidy and its predecessors. In this chapter, I argue that there is a new trend (a sharp increase) of the research output of South African HEIs since the introduction of the NFF in 2001. See Section 4.6.3. ("The new funding framework for higher education: *Policy for the measurement of research output of public higher education institutions in South Africa"*). In other words, this chapter argues that there is a strong correlation between an increase in the research output of South African HEIs and the introduction of the NFF.

While the focus of this thesis is primarily on the South African HEIs' knowledge production, this chapter includes an overview of the global research output trends. The African continents' contribution to the global knowledge production is also highlighted as a means of locating South

[71] Dr David Woods (Vice-Chancellor, Rhodes University) has presented notes entitled "Research funding and the consequences for university research" at the Harold Wolpe Memorial Trust forum meeting at the Iziko Museum, Cape Town, 17 February 2005.

Africa's standing among the developing countries, as it is a significant contributor to African share of knowledge production. The quest of this chapter is to present empirical evidence that indicates the positive effects that the NFF has had on South African HEIs' knowledge production.

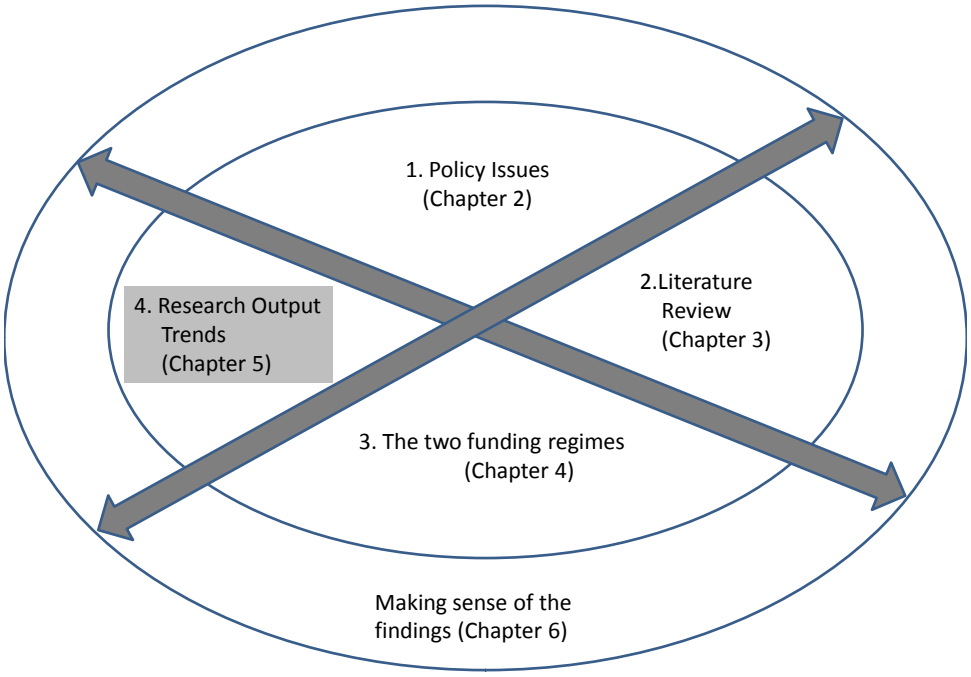
Research is the basis of knowledge gained at higher education level. In the humanities, this underpins everything we have managed to learn so far about social structures and values, human behaviour and more. The role of research in providing insight into the "why" and the "how" remains invaluable. It is from this understanding that this chapter is aimed at answering the following research question:

> *Can we see a new trend after 2001 in higher education research output? If there is a new trend, how do we explain that?*

In this chapter, the hypothesis is tested and the results thereof are discussed. Cohen, Manion and Morrison (2000:3) write that scientists construct their theories carefully and systematically. Whatever their hypotheses they formulate have to be tested empirically so that their explanations have a firm basis. Hypothetically, this chapter argues that the current higher education funding framework has had positive effects on the knowledge production of HEIs as the output has steadily increased since 2003. Refer to Section 1.6. ("Theory and research hypothesis"). The central focus of this chapter is on the research output trends as a means of making a scholarly contribution to the research community at large and to the policy studies community in particular.

While the previous chapter was about putting up the structure, through a comparative analysis of the two funding regimes, this chapter on roofing by means of research output trends analysis, is the centre around which this thesis revolves as illustrated in Figure 5.1.

Figure 5.1. Chapter 5 (Research output trends), the crux of the thesis



An analysis of Figure 5.1. reveals the sequential relationship of Chapter 5 with its predecessors towards presenting the findings of this thesis, as will be done in Chapter 6.

The chapter is ignited by highlighting factors that influence knowledge production, followed by a discussion on how the research output products are estimated. The world output trends are then overviewed before discussing Africa's research output trends. This approach is meant to lay a foundation for the focus of this chapter, that is, to trace the research output trends of South African HEIs with a special reference to the years 2001 to 2006.

5.2 Factors influencing knowledge production

The research output trends, more especially of the African continent are indicative of various factors that impact on the higher educations' knowledge production. See Section 5.5. ("Africa's research output trends"). The factors impacting on the low research output of the African countries are many. Ntiamoah-Baidu (2008:3) identified the following key issues: (a) shortage of senior level academics and researchers; (b) Inadequate research facilities; (c) lack of adequate financial resources to invest in research; and (d) increasing demand for higher education, resulting in increased focus on undergraduate training at the cost of post graduate training and research.

Without highly qualified and motivated senior academics at PhD level, who are engaged in relevant and innovative research, a university cannot respond to its obligations towards society and national development, in terms of generating the knowledge that fuels industries and technology transfer (*ibid.*). Researchers at HEIs in Africa need to adequately respond to the challenges facing the continent such as conflicts, poverty, unemployment, environmental degradation and health care. Therefore, factors identified by Ntiamoah-Baidu are negatively impacting on the output production of HEIs.

Okebukola (2002) identified the following factors that have contributed to the decline in Africa's research output production from the late 1990s: (a) lack of research skills in modern methods; (b) lack of equipment for carrying out state-of-the art research; (c) overloaded teaching and administration schedules which leave little time for research; (d) difficulty in accessing research funds; and (e) diminishing ability of seasoned and senior researchers to mentor junior researchers due to brain drain.

The need to strengthen the HEIs capacity and research expertise through training; increased funding and improved infrastructure among others has

become of greater importance if Africa is to increase its share in the world's knowledge production. Benneh (2003:9) is of the opinion that the provision of well-trained researchers is, perhaps, the single most important factor in enhancing the research capacity of African universities.

Of particular relevance to South Africa, some of the factors that strongly influence research productivity in higher education include: funding policies; massification or mergers of higher education institutions; demography of researchers; the number of journals accredited by the Department of Education for subsidy purposes; and the worldwide publication trends. A critical factor that influences higher education research productivity is "policy", both in the form of national and institutional policies coupled with the subsidy formula.

5.2.1. Higher education funding policies

Across the world, research performed by the higher education sector is largely government-funded. Governments fund academic research through "general university fund", that is block grants directly given to higher education institutions (and then allocated by them to research and teaching), as well as through direct research grants and contracts given to particular research projects (Vincent-Lancrin, 2006:9). Also see Chapter 1 of this thesis for governments' consideration of higher education funding.

The policies and procedures for submitting and capturing of the higher education research output are some of the contributing factors that influence knowledge production output trends. In South Africa, other contributing factors include the vetting of the research output claims by the DoE, the amount of funds generated through the research output claims, and the allocation of funds to the institutions and the researchers.

5.2.2. Demography of researchers

The demographic composition of the researchers in HEIs is influenced by the mobility, number and the ageing of researchers or academics and other variables. For the purpose of this thesis, the variables to be considered are mobility, number of researchers and ageing researchers.

5.2.2.1. Mobility of researchers

The migration of researchers is experience worldwide. Both the developed and developing countries are affected by the mobility of researchers although the impact thereof is different. South Africa compare favourably in the growth of its researchers and R&D personnel. The migration of researchers, especially from other African countries, to South Africa may be a contributing factor in explaining an increase in the research output since 2001. Figure 5.2. below, presents world trends on the growth in researchers and R&D personnel.

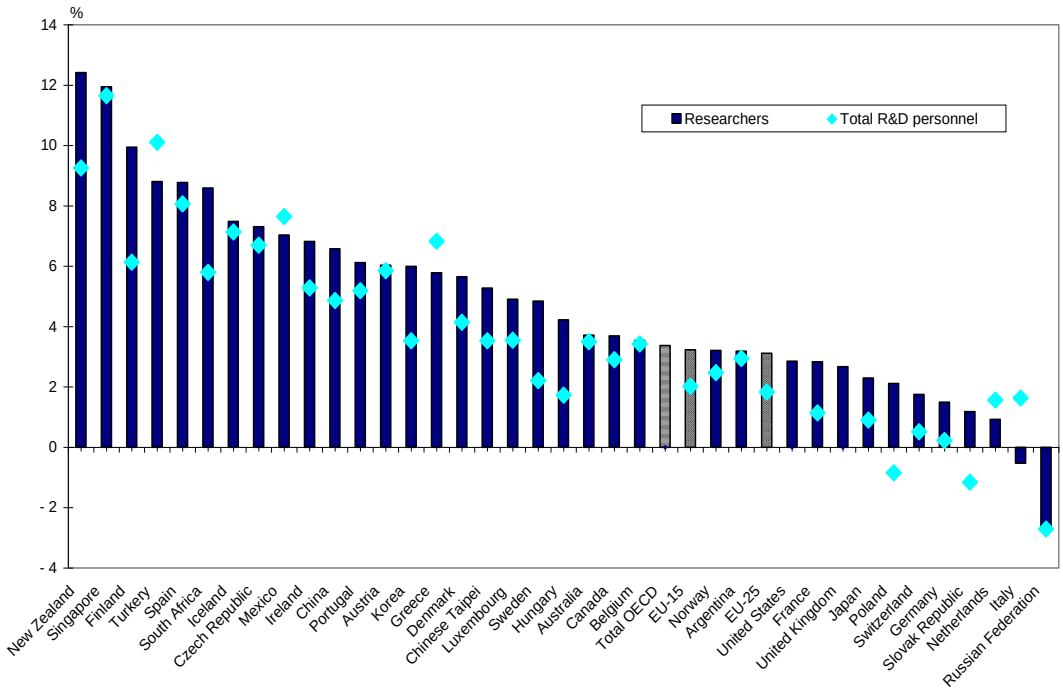


Figure 5.2. Strong growth in researchers and R&D personnel

Average annual growth rate, %, 1995-2005

Source: Basri (2007)

An analysis of Figure 5.2. suggests that South Africa is ranked number 6 in terms of the strong growth of researchers brought about by international mobility of researchers. In the African continent, South Africa is the only country that features in the international growth rankings. Naidoo (2007:3) justifies South Africa's ranking through the following statements: (a) South Africa is a global supplier of knowledge workers; (b) emigration is significant; (c) we have had three South African born Nobel Laureates in the sciences that have done their major scientific work elsewhere – Theiler, Klug and Brenner; (d) South Africa is a recipient of knowledge workers; (e) the country has significant numbers of returnees; (f) immigration is significant, largely from Sub-Saharan Africa; and (g) South Africa is a preferred destination of Science and Technology.

The preference of South Africa by researchers, especially from Sub-Saharan Africa, is very important in that such researchers may contribute significantly towards an increase of research output. The mobility of researchers has contrasting effects for the sending and receiving countries and globally. For the sending countries, at least two possible negative effects can be highlighted. That is, "*brain drain*" in terms of lost productive capacity due to at least temporary absence of researchers and students with higher skills; and less support for public funding of higher education. For the receiving countries, possible positive effects include among others: (a) increased R&D and economic activity due to the availability of additional highly skilled researchers and students; (b) knowledge flows and collaboration; and (c) increased ties to foreign research institutions.

The possible global effects of the researchers' mobility include among others: (a) improved international flow of knowledge; (b) better job matches through global job search; (c) greater job options for researchers; and (d) net positive effect on incentives for individual human capital investments as a result of international competition for scarce human capital.

South Africa's growth in the mobility of researchers suggests that the country has the potential to increase its world knowledge production ranking as measured through research output. There is no doubt that researchers migrating to South Africa contribute towards an increase in the knowledge production of the country as well as on improving its world ranking. The mobility of researchers is closely related to the ageing of researchers at HEIs around the world.

5.2.2.2. Ageing researchers

The production of research output as a function of the age of the researchers in the system is an extremely important and sensitive diagnostic of the overall state of the research system since it is a first measure of the system's medium- to long-term sustainability (Bawa and Mouton, 2002:321). South Africa's scientific workforce is ageing, with few young researchers being attracted into the system. In 1990, only 20% of peer-reviewed of peer-reviewed articles published in South Africa were written by people older than 50, but this figure had risen to 49% by the year 2000 (Nature, 2007).[72] However, it can be argued that there has been no change registered in terms of publishing researchers. The majority of active publishers remain to be those older than 50 years.

Habib and Morrow (2006:9) add that, for some years researchers have been ageing without adequate renewal taking place. They further note that South Africa's scientific personnel are mainly white and male, and ageing rapidly. Bawa and Mouton (2002:322) conclude that the fact that more than 70% of the research output is produced by academics over 40 years of age, and the limited increase in the production of PhDs indicates that a serious problem has arisen with reproducing a next generation of academics.

[72] Nature is an online International weekly journal of science. It is also available in hard copies.

In its editorial, Nature (2007) reports that there was no significant change in the demographic profile of publishing scientists between 1990 and 2000, with white scientists continuing to produce more than 90% of peer-reviewed articles. Women, who make up 40% of the academic staff at the South African universities, are responsible for authoring only 17% of articles. If this is not urgently addressed, it will result in the decline of the country's scientific profile and infrastructure in the coming decades. Apart from the demographic composition of researchers, in the South African context, another contributing factor affecting knowledge production, as measured by the DoE, is the recognition of accredited and non-accredited journals for subsidy purposes.

5.2.2.3. Accredited and non-accredited journals

Academic journals are the major avenue through which scientists communicate their results, and exchange observations. Scientific journals are the means by which the scientific community certifies accumulation and additions to its body of accepted knowledge and the means by which scholars compete as if in a mental Olympiad for prestige and recognition (Campanario, 1998:181). However, not all scientific journals in which researchers are publishing are accredited by the DoE. Related to the accredited and non-accredited, another factor that influences the research output of South African HEIs is the DoE subsidy allocations and incentives awarded to published researchers.

5.2.2.4 DoE institutional subsidy allocations and incentives

While good research infrastructure, that is, modern laboratories with up-to-date equipment, computers and library facilities would, no doubt, facilitate the conduct of research, the strongest driving force in the research enterprise is the researchers. Motivated by effective incentives and reward

systems, researchers can overcome practical difficulties and carry out research activities using the most primitive equipment to achieve outstanding results, thus increasing the quality and quantity of research output (Benneh, 2003:6). Arguably, incentives play a vital role in motivating researchers' productivity. HEIs use university research funds to incentivise productive research and to encourage those who are not so productive.

Generally, university funds give universities (and other higher education institutions carrying out research) full freedom to allocate these funds within their institution. However, the management of these funds within universities has also become increasingly competitive and based on departmental research evaluation (Hazelkom, 2009:56). In South Africa, a large portion of the annual subsidy allocation is dedicated to reward institutions whose academics publish often and who supervise and promote masters' and doctoral students.

In South Africa, while the incentive scheme for rewarding meritorious research achievement has been in existence before the introduction of the NFF, the scheme has effectively been promoted since the introduction of the NFF in terms of recognition of contributors in publications (journal articles, books and conference proceedings) as well as for master's dissertations and doctoral theses. The Rand value of a unit has increased dramatically from just more than R20 000 on top of the blind component before the NFF to about R95 000 in 2006. This means that every article published in the DoE accredited journal (for example, the Journal of Public Administration), for the 2006 reporting year, has yielded R95 000 for the academic institution to which the author is affiliated. Yet, the incentives offered to authors vary considerably across all higher education institutions. In order to encourage and sustain knowledge production, institutions have various incentive schemes for publishing academics. For example, the School of Management Sciences of the University of South Africa annually recognises its outstanding researchers by means of research awards to the maximum

of R20 000. In addition, each published article earns the author an amount of R12 000 in research funds.

In 2005, Johnson conducted a survey to form an understanding of how institutions divide output subsidy generated from the DoE through research publications. The results of the survey suggest that at institutions where there is a major drive to increase research output (e.g. North-West) a larger proportion is allocated to individuals than at “established” research universities such as the University of the Witwatersrand and the University of Pretoria. However, all the respondents indicated that in the light of the new subsidy formula, they are considering new incentives to maximize their share of subsidy. Table 5.1. presents a summary of the incentive schemes of selected HEIs.

Table 5.1. Incentive schemes for research output

INSTITUTION	
North-West (Potch campus)	R14k in research account of researcher of which R7k may be taken as salary (taxable). A small portion is allocated to faculties. The balance goes to the central budget.
Wits	Until 2002, R5 000 per unit was paid to faculties – since then it became one of three elements used in calculating how 70% of the research budget is allocated to faculties.
UCT	Researchers could qualify for promotion if certain number of articles were published. There is however no direct reward for individual researchers.
UWC	R3,5k paid to authors.
TUT	70% of unit value to research account of the researcher.
US	Portion to the research account of the researcher and some to the faculty.
Rhodes	Small portion to the research account of the researcher.
UPE	R3 000 per unit to research account of researcher and over a number of years more funding via a points system.
PET	R12 000 to research account of researcher and R6 000 to faculty.

Source: Johnson 2005

The incentive schemes offered to researchers in HEIs are not immune to criticisms. Vaugham (2008:93) argues that while on the face of it this could be a reasonable strategy to improve research productivity, it does have some serious drawbacks. First, the scheme rewards those who pursue the least publishable unit. That is, researchers are rewarded for short reports of dubious validity and value in low ranking journals. However, it should be noted that such low ranking journals are accredited by the DoE. Second, it favours academics whose research field is conducive to multiple annual papers per annum (such as zoology, education, law and public administration) versus those who may publish only one or two papers per annum (for instance mathematics and accounting) or those who publish important policy documents that draw no subsidy at all (for example, public health specialists).

Third, there is the distinct possibility that such funds, even when paid into a research fund rather than directly into the individual staff member's personal bank account, may be considered a personal benefit by the South African Revenue Service and would therefore be liable to personal income tax.

In criticising the incentives advocated by the NFF, the OECD (2008:360) postulate that the way in which incentives for HEIs are to become more efficient are being administered under the NFF, through norms for research output and for graduation rates, may have the adverse effect of neutralizing the very same intended effect within the sector. This can happen because the money not allocated to "under-performing" HEIs that have not met the norms, will be re-allocated to the same institutions in the form of development grants. This may push these institutions to do more, but it does not seem to provide incentives to institutions where more research is done to do more. Thus, setting higher standards does seem to have reverse effect: it channels money away from HEIs producing the research that high standards are supposed to stimulate.

In attempting to contribute towards a significant increase in the number of subsidy generating research publications, especially articles in journals, this thesis recommends the introduction of a national incentive scheme. Currently, HEIs use varying incentive schemes to reward publishing researchers. However, rewards should be viewed as an incentive to publish more than the benchmark. Having outlined some of the factors that influence the production of research output, the following section presents some key findings on the trends of HEIs research output.

5.3. Estimating research output products

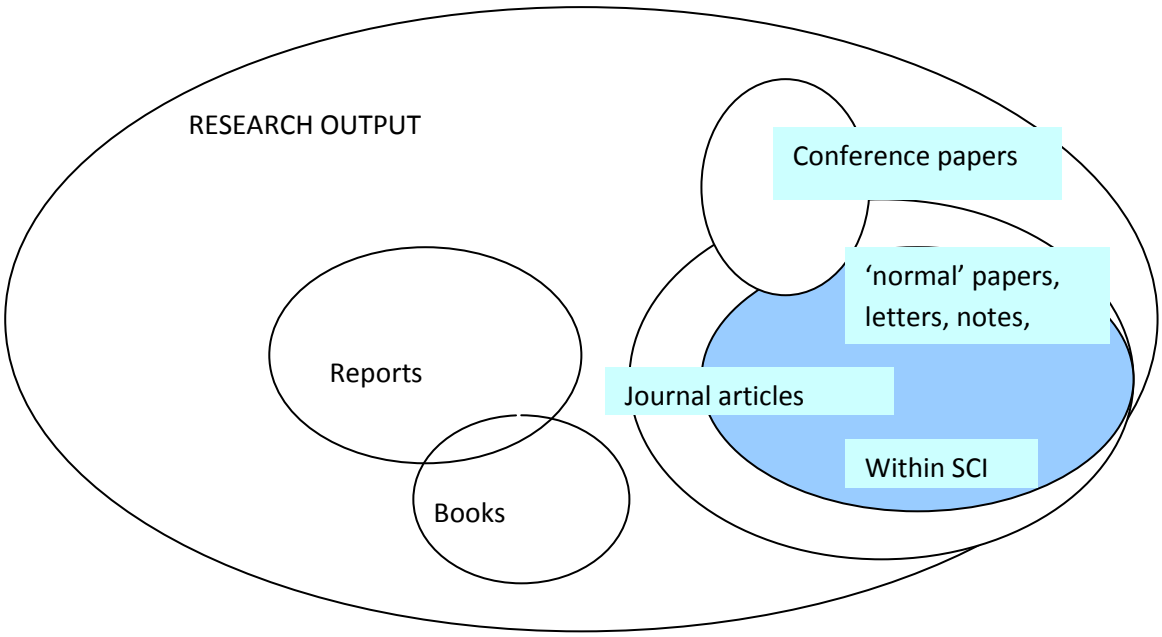
The assessment of the performance of higher education institutions in terms of their research output or knowledge production should take into account quantity and quality. The means for estimating the value of research output of universities has proved to be a controversial discourse. Not only is it necessary to capture the quantity of output, which can be quite varied and given weight, but also the quality of the work must be accounted for (Abbott and Doucouliagos, 2003:92). See Section 1.6. ("Theory and research hypothesis"). This argument is valid in both the natural sciences and the humanities. Moed (2005:25) argues that with regard to "*research quality*", on the one hand, research quality is not merely a social construct. It does not coincide with what scholars define or decide upon as quality, even if they have reached a consensus. It relates to quality intrinsic to the research itself. On the other hand, the concept cannot be defined and measured in the same way as across all disciplines.

Jeenah and Pouris (2008:353) postulate that research productivity varies according to scientific fields. Moreover, publication practices differ widely across disciplines in terms of co-authorship practices, the typical number of publications per year, and even the definition of what counts as a scientific article. They continue to state that in some disciplines, researchers are not expected to produce more than one article per year, while in others the typical annual output is in the range of 10 to 20 articles. This chapter, therefore, brings to light the world research output trends and in particular South Africa's output trends since the introduction of the current policy. For the purpose of this study, world output trends are considered important from the comparison point of view.

5.4. Worldwide research output trends

Higher education is a complex enterprise, and any discussion of accountability and productivity must take account of that complexity. The enterprise, if it is to be held accountable and its productivity accurately assessed, must be described in its totality. This includes special emphasis on the outputs or products of higher education (Middaugh, 2001:29-30). Considering the complexity of the research enterprise, research needs to be communicated and this is done in the form of conference papers, articles published in accredited journals, registered patents as well as scholarly books, as shown in Figure 5.3. below.

Figure 5.3. Types of research output



Source: Madue, 2006:21

According to Dundar and Lewis (1998:608), although research productivity in higher education has a multidimensional character as it relates to both knowledge production and knowledge dissemination and should be equated to teaching and outreach activities, research productivity in particular has received a greater amount of attention and concern. Research effort and output form a very distinguishing part of definitional character of research universities.

Globally, the growth of the research output between 1988 and 2006 is considered to be a major trend in academic research output. It is highly correlated with (and probably well explained by) the growth of R&D expenditure of researchers and governments in the higher education sector. However, in the South African context, the correlation does not exist since a decreasing trend on the state expenditure on higher education has been observed since 1987. See Section 1.3. ("In the real South African context"). Vincent-Lancrin (2006:3) writes that about 650000 new scientific articles have been published in 2001, a 39% increase compared to the 466000 published in 1988. About 82% of them were produced by the OECD countries. In the United States, the higher education sector authored 74% of all the US scientific articles in 2001. Similarly, the number of new academic books has increased – and probably the number of books published by academics. For example, books published in the United States' university presses have increased by 21% between 1993 and 2004; and academics have probably been responsible for a larger amount of the 74% increase in books published in the US over the same period (*ibid*.).

The South African research output does not compare favourably with developed nations such as the US and the OECD countries. For example, during the period between 1993 and 2003 the publication rate of universities in South Africa was about 0.5 publications per permanently appointed

research personnel[73] member. This means that one staff member in the South African HEI produced one approved publication every two years. In the technikon sector, the publication rate for 2003 was as low as 0.061.

Further background is now provided. In terms of citation analysis as a measure of research output, Jeenah and Pouris (2008:351) report that South Africa has a strong presence in the world trends. However, they argue that although South African scientists produce more than 7000 publications annually, as a percentage of the global output, this total is relatively less impressive than the 2594 publications in Geosciences in a decade. The background information on South Africa's presence in the world research output trends explicitly contributes towards the confirmation or rejection of my hypothesis. Refer to Section 5.6.3. ("Re-instating the hypothesis").

In comparison with other developing countries, again, South Africa compares unfavourably with two other countries, that is, Brazil and India. According to the Essential Sciences Indicators (ESI) analysis of the ISI database, Brazil is ranked in the top 20 countries in 12 disciplines, with a high of 11th position in Agricultural Sciences. India is among the top 20 countries in 13 disciplines in the top 10 in the world. South Africa is rated in the top 20 countries in only 2 disciplines, Plant and Animal Sciences at position 18 and Geosciences at number 20. Table 5.2. below presents a comparative analysis of the three countries in the world publications rankings per discipline. While the world research output trends are invaluable in locating South Africa's international ranking, this research was also concerned with Africa's ranking when compared with other continents.

[73] Research personnel in this context includes both lecturers and researchers who are not necessarily involved in teaching activities.

Table 5.2. Relative ranking of South Africa, India & Brazil, Publications (2005)

FIELD	COUNTRY RANKING		
	SA	INDIA	BRAZIL
1. Clinical Medicine	30	23	22
2. Plant & Animal Sciences	18	8	12
3. Chemistry	31	8	19
4. Geosciences	20	11	21
5. Biology & Biochemistry	36	15	21
6. Environment/ Ecology	22	13	18
7. Physics	43	10	15
8. Molecular Biology & Genetics	37	20	18
9. Space Science	28	13	17
10. Microbiology	30	18	13
11.Immunology	29	21	16
12.Engineering	42	12	22
13.Social Sciences (general)	21	22	20
14.Phyciatry/ Psychology	24	32	29
15.Neuroscience & Behaviour	40	24	13
16.Agricultural Science	38	4	11
17.Pharmacology/ Toxicology	35	11	16
18.Material Science	46	9	20
19.Mathematics	37	14	17
20.Computer Science	38	17	25
21.Multidisciplinary	9	4	18
22.Economics & Business	33	27	36
All fields	35	13	17

Source: ISI database

While the world output trends are important in locating South Africa's international ranking, this research is also concerned with Africa's ranking when compared with other continents. Tracing South Africa's ranking in the world output trends lays a foundation for determining HEIs research output trends. But before concentrating on South African HEI research output trends, it is also of importance to view the output trends in the African continents.

5.5. Africa's research output trends

A large body of evidence suggests that Africa's contribution to the world research output has sharply declined in recent years. With regard to the Africa's publication trends, Tijssen (2007:307) reports that Africa's long-term publication output trends indicate that its contribution to global knowledge production has slipped during the 1990s. Africa has lost 11% of its share in global science since its peak in 1987; Sub-Saharan science has lost almost a third (31%).[74] Tijssen's findings are supported by Chiemeke, Longe, Longe and Shaib (2009:3) in which they state that by 1996, Africa's quality and quantity of research had declined to an all-time low.

The Economic Commission for Africa (2008:1) reports that Africa is home to more than 15% of the world's population, yet it produces less than 1.5% of the world's scientific knowledge – as measured in peer-reviewed international journals. Tijssen (2007) cites the lack of resources in many African countries, and the lack of the willingness to invest in infrastructure and modern equipment as one of the main reasons for the decline. Again, Chiemeke *et al*., (2009) argue that the foundations for research are good research training and motivation, availability of equipment, and good library

[74] For a detailed analysis of trends in African research article output in the international literature, see Tijssen (2007). Dr Robert, J.W. Tijssen is a scientometrics professor at the Centre for Science and Technology Studies (CWTS), Leiden University (The Netherlands) and a research associate of the Centre for Research on Science and Technology (CREST), Stellenbosch University (South Africa).

facilities. Another explanation for the significant decline of Sub-Saharan publication output is the removal of African Journals from the Citation Indexes; for example, the number of South African journals dropped from 35 to 19 during the years 1993 – 2004.

Africa's output in the international journal literature is extremely skewed; the largest country (South Africa) accounts for more than 31% of Africa's publication output, and the first and second country (Egypt) jointly account for 52% (Tijssen, 2007:312). Only Algeria and Tunisia have been able to generate noticeable growth during the years 2001 – 2004. A detailed study by Waast (2002) informs us that some countries in Sub-Saharan Africa, such as Nigeria, have regressed in many fields of science. In other countries, whole areas of expertise have virtually disappeared, such as agricultural sciences in Kenya and Côte d'Ivoire. South Africa is an active player in put the African continent on the map as far as research output productivity is concerned. Having discussed the research output trends of the world and of the African continent, it becomes important to focus on the trends of South African HEIs before and after the introduction of the new funding framework.

5.6. South Africa's HEI research output trends

Although South Africa compares favourably with other African countries in its contribution to the global knowledge production, its research output had been declining in the 1990s. This state of affairs is supported by empirical findings such as those of Habib and Morrow (2006), Kahn and Blankley (2005), Pouris (2003; 2005; 2007) and Pouris and Jeenah (2008). They all come to the same conclusion that South Africa's research output is declining. However, it should be noted that their research did not adequately cover the period in which the current funding formula was introduced, that is, 2001 to 2006.

Since the introduction of the SAPSE formula in 1985, higher education knowledge production has been recognised and subsidised on the basis of published refereed journal articles. Bawa and Mouton (2006:311) explain that in the 1990s books (but not textbooks) as well as chapters in refereed anthologies were also included for subsidy purposes. While the SAPSE formula was faced with numerous challenges, the data obtained from it provides a useful perspective on knowledge production by HEIs.

5.6.1. Projected output trends after the introduction of the NFF

The introduction of the NFF was aimed at increasing the number of outputs produced by the South African HEIs as discussed in Section 4.8 ("About the new funding framework"). When looking at the policy for the first time, I have projected a steady increase to be expected between the years 2001 and 2003, as a result of the transitional period from the old SAPSE system to the NFF. The basis of my projection is a sharp increase (over 5500 outputs) in research output experienced in 2000 just after a decline in 1999 where less than 5000 outputs were produced. Therefore, for the years 2004 to 2006, I have projected a sharp increase as my assumption was that by then the HEIs shall have been well acquainted with the implementation of the NFF.

5.6.2. Tracing South African HEIs knowledge output trends

In tracing the trends of knowledge production, Figure 5.4. presents the trends in South African HEIs knowledge production as obtained from the Higher Education Management Information System (HEMIS) SAPSE database of the DoE. Figure 5.4. provides absolute values of publication numbers as a measure of the South African HEIs research output.

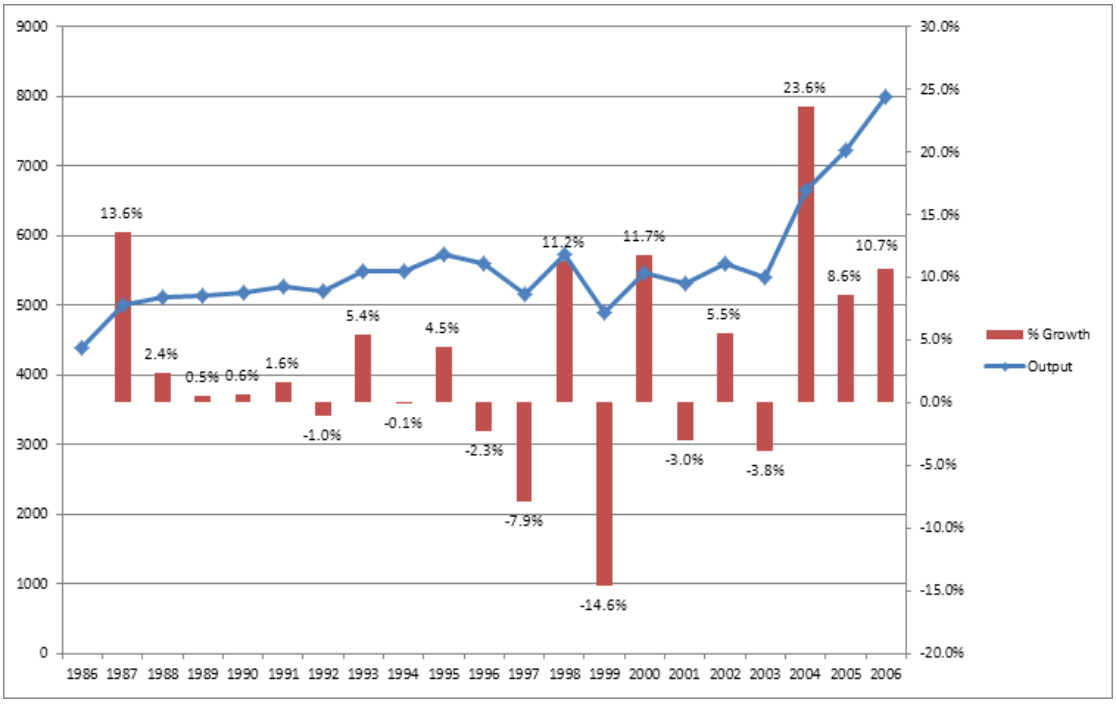


Figure 5.4. Total actual research output of South African HEIs

Source: HEMIS database, Table 2 to Table 6.3., DoE 2008

South Africa's recorded knowledge production as measured by the research output proxy has steadily grown from a reported figure of 4400 in 1986 to 5600 ten years later. From 2003 the number of research outputs has increased at a rapid rate. This can be seen on Figure 5.4., where in 2004, the research output increased by 23.6% which is the highest percentage growth rate on average*. For the period under review, the research output has increased by 14 % which is the annual growth rate between 2003-2006. Average is a calculated compounded annual growth rate using the formula below.

$$\mathrm{CAGR}(t_0, t_n) = \left(\frac{V(t_n)}{V(t_0)}\right)^{\frac{1}{t_n - t_0}} - 1$$

The thesis acknowledges that in research, the term "*statistically significant*"[75] refers to an inference where two variables are shown to differ considerably with a *P*-value[76] of, say, <0.05 or 0.001. This thesis argues that a considerable increase has been registered as a result of the introduction of the NFF in 2001. Therefore, the increase is explained as being "*significant*"[77], since this study has only concentrated on the annual percentage growth rate of research output (univariate) over a period of time and not on comparing two variables. See Section 4.5.1. ("Advantages of funding formulas"). In other words, the t-test was not conducted in this case, as it was not applicable.

It should be noted that between 1986 and 2003 the research output increased by 1.52% on average and 3 % between 1986 and 2006. It is also worth noting that Figure 5.4. reveals that for the reporting years of 1997 and 1999, the research output produced registered a sharp decline of -7.9% and -14.6% respectively. For the period under study (2001 to 2006), a sharp increase in research output has been registered, especially between 2003 and 2006 (14% annual growth rate) in comparison with the previous five years before the introduction of the NFF. A further analysis of the 2001 to 2006 output is discussed in Section 5.6.3. ("Re-instating the hypothesis").

A further study conducted by the Council on Higher Education in 2004, using the same data exhibited in Figure 5.4., revealed that the SAPSE article output data in universities dropped by a little more than 2% over the six year

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[75] The likelihood that a result or relationship is caused by something other than mere random chance. Statistical hypothesis testing is traditionally employed to determine if a result is statistically significant or not. This provides a "p-value" representing the probability that random chance could explain the result. In general, a 5% or lower p-value is considered to be statistically significant (http://www.investopedia.com/terms/s/statistically_significant.asp).

[76] The level of marginal significance within a statistical hypothesis test, representing the probability of the occurrence of a given event. The p-value is used as an alternative to rejection points to provide the smallest level of significance at which the null hypothesis would be rejected. The smaller the p-value, the stronger the evidence is in favor of the alternative hypothesis. P-values are calculated using p-value tables, or spreadsheet/statistical software (http://www.investopedia.com/terms/s/statistically_significant.asp).

[77] The word "significant" is not the exclusive domain of statisticians. Many researchers use the word "significant" to describe a difference or relationship that may be strategically important to a client (regardless of any statistical tests). In these situations, the word "significant" is used to advise a client to take note of a particular difference or relationship because it may be relevant to the client's strategic plan (http://www.statpac.com/surveys/statistical-significance.htm).

period 1995 – 2001 (from 5438 publication units in 1995 to 5311 in 2001). Other South African authors (Jeenah and Pouris, 2008; Madue, 2006; Pouris, 2006; 2007; Steyn and De Villiers, 2006; Vaughan, 2008) have conducted related studies using the same data obtained from the HEMIS database to come to similar conclusions.

In attempting to address the decline in the research output, Vaughan (2008:93) further elaborates that one measure to increase South African HEIs research output would be a greater share of publications indexed by the Institute for Scientific Information (ISI). Vaughan (*ibid.*) further argues that there was indeed a steady increase in ISI-accredited publications between 1990 and 2002, while the number of publications in DoE-accredited journals was static. However, it should be pointed out that Vaughan also uses citation analyses to determine the South African HEI research output. The ISI citation analysis only includes cited articles that appear on its database. Not all the South African journals recognised by the DoE for subsidy purposes are appearing in the ISI database.

This study has also compared the research output trend 2001 to 2006 against the headcount of instruction/research professionals as illustrated in Figure 5.5. below.

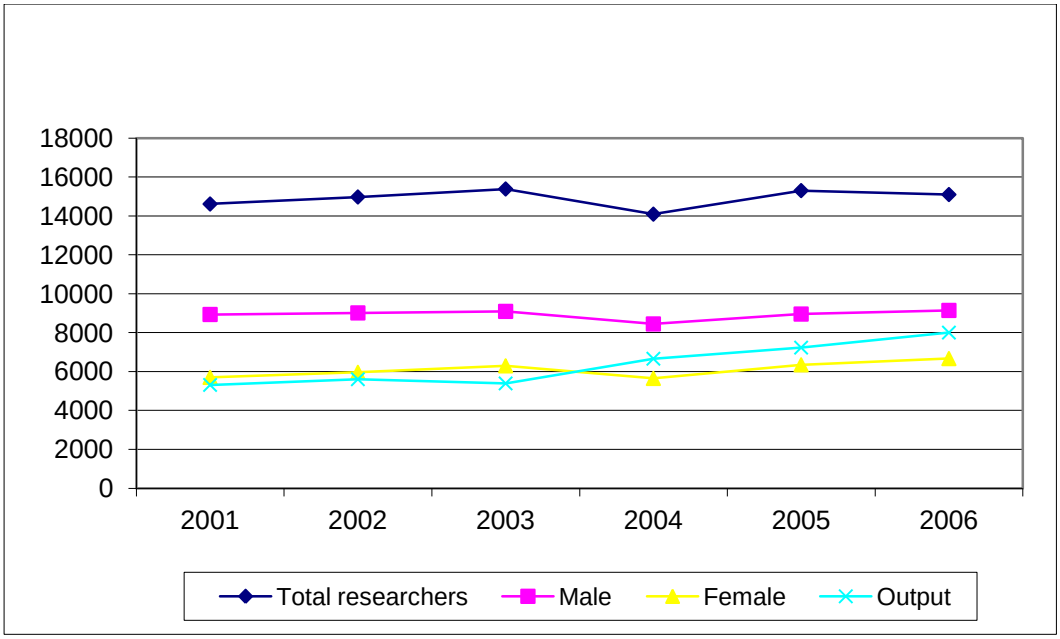


Figure 5.5. Headcount of instruction/research professionals v/s research output 2001-2006

Source: HEMIS Database (2001-2006), Table 3.5 staff members of all HEIs

Recent studies (Habib and Morrow, 2006; Kahn and Blankley, 2005; Madue, 2006; 2007; Pouris, 2003; 2005; 2007; Pouris and Jeenah, 2008) have reported on the scientific production of the HEIs until around 2001. For example, the latest DoE (2004) studies using the 2001 figures found that the New Institutional Landscape in comparison with the "old" situation does not reveal a fundamentally different picture of knowledge production. The finding is not surprising, since the majority of the researchers who were employed in the South African HEIs before the introduction of the NFF were still active in those institutions for the period under study.

Figure 5.5 shows a fluctuation of researchers employed in the HEIs between the years 2003 and 2006 with a slight decline in 2006 while the research output for the same period has recorded a consistent increase. It is worth noting that while the male researchers are still dominating the production of research output, female researchers have registered a steady increase from 5400 in 2004 to 6200 in 2006.

In Table 6.3[78] of the HEMIS database, the DoE reports that under the old cost-based funding system (1996 to 2001), the research output per staff member improved by 5% while under the current performance-based funding framework (2002 to 2008) the research output per staff member improved by 22%. The DoE explains that one of the factors contributing to the 22% improvement is increasing from 2002 onwards the rand value per publication unit by a factor of 3. The rand value per publication has increased from R20 000 in 2001 to R95 000 Research output units per staff member has increased from 0.69 in 2002 to 0.84 in 2008.

5.6.3. Re-instating the hypothesis

This study was concerned with the South African HEIs' scientific production trends since 2001. The rationale behind choosing the reporting years of 2001 to 2006 was to highlight a possible new trend that might have been registered since the introduction of the NFF. This chapter argues that we can see a new research output trend of South African HEIs from 2001 to 2006 as shown in Figure 5.4. The annual growth rate of 14% has been registered between 2003 and 2006. The trend has confirmed the hypothesis as stated in Section 1.6. and addressed Sub-objective 3 ("Explain the trend after 2001") in Section 1.8. above.

The trend in knowledge production since 2001 shows a steady increase in knowledge production in comparison with the reporting years of 1987 to 2000. A sharp increase is further noted from the reporting years of 2003 to 2006. The South African HEIs have increased their knowledge production with a growth of 14% from a total output of 5390 in 2003 to 8002 in 2006. The finding is further supported by Table 6.3 of the HEMIS database in

[78] Data obtained from Table 6.3: Actual unweighted research output and actual unweighted staff in research output block grant according to university and year. http:www.education.gov.za/dynamic/dynamic.aspx?pageid=326&dirid=14

which the DoE 2008 data shows the average annual increase of 5% in research output from 2002 to 2008.

The central argument of this thesis is that the introduction of the NFF in 2001 has influenced a relative increase in the knowledge production of HEIs in South Africa. It should be noted that alongside the NFF was the implementation of the transformation of the higher education institutional landscape where HEIs were merged and incorporations started to take effect since 1995. Most HEIs were effectively merged since 2001. The argument that the increase in South African HEIs' knowledge production was as a result of the introduction of the NFF is thus made mindful of the implementation of the mergers and incorporations. Therefore, this study argues that there is no documented evidence to date on the correlation between the mergers and an increase in HEI research output since 2001. Since the research output data is mostly obtained from the HEMIS database of the DoE, it becomes important to also trace South Africa's output trends in terms of papers listed on the ISI database.

5.6.4. Tracing SA research outputs on the ISI

Furthermore, the ISI database also reveals an increasing trend of papers published by South African authors as indicated in Figure 5.6.

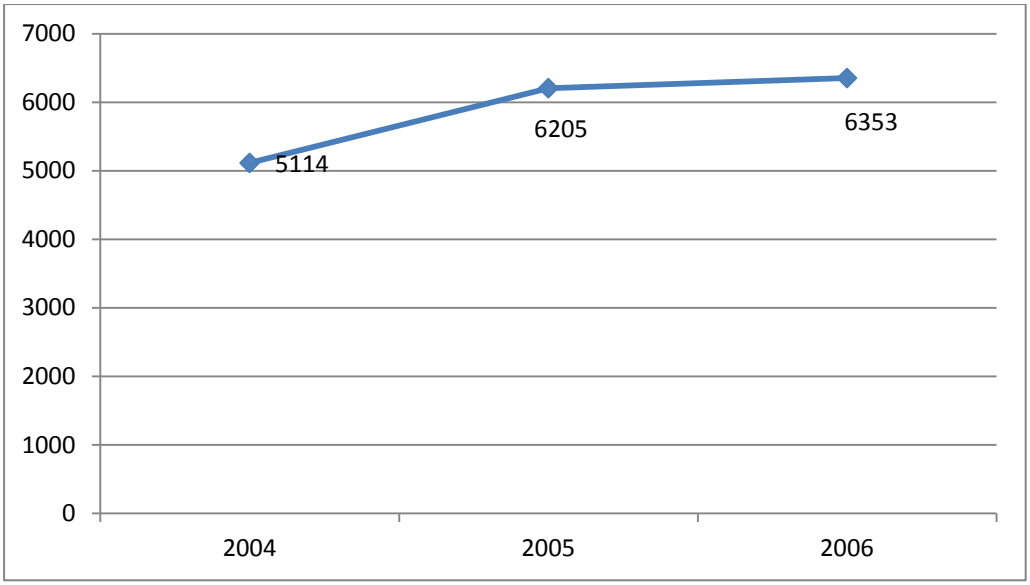


Figure 5.6. ISI papers authored by South Africans

Source: ISI Web of Science database

An analysis of the ISI data on South African authored papers reveals a steady increase of 32% between 2004 and 2006. A deduction can be made that an average growth of 16% per annum has been registered in this regard. This finding is corroborated by recorded data on the period under review as found on the DoE database. The HEMIS database also indicates a steady increase of ISI journals and other DoE recognized journals as reported by South African higher education institutions for subsidy purposes, as illustrated in Figure 5.7. below.

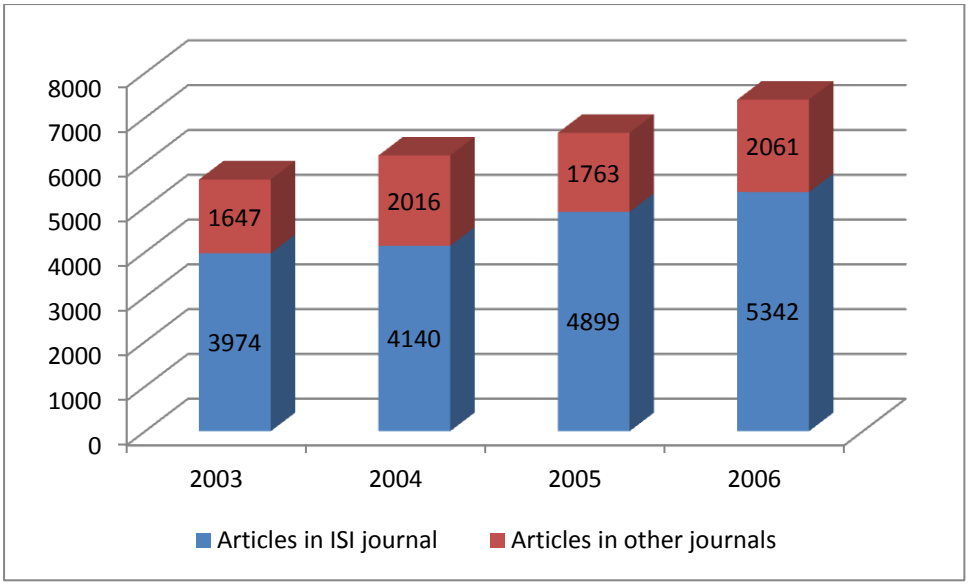


Figure 5.7. Journal articles reported by SA public higher education institutions for subsidy purposes

Source: HEMIS database, DoE 2008 Table 3 to Table 6.

Figure 5.7. indicates a steady increase of South African authored articles listed in both the ISI and other journals that were not listed in the ISI database between 2003 and 2006. The increase can be further correlated with an increase in SA HEIs output since the introduction of the NFF. Furthermore, Tijssen (2007:307) reports that some African journals have been removed from the Citation Indexes; for example, the number of South African journals dropped from 35 to 19 during the years 1993-2004.

The above figure indicates that South African researchers are not only targeting to publish their articles in DoE accredited journals (i.e. mostly local journals) but are equally focusing on publishing in international journals listed in the ISI database. However, it should be stressed that the ISI journals are also accredited by the DoE and thus included in the DoE list. In 2006 for example, South Africa's output appearing in journals listed on the international indices accrued 57% of the 2008 reporting year's allocation for journal outputs produced by HEIs compared to 55% registered in 2005 for the 2007 reporting year. From this point, using the 2006 research output, it

would be interesting to see which scientific discipline contributes most journal articles.

5.6.5. SA Journal articles per scientific discipline published in 2006

It was earlier explained in Chapter 4 that the natural sciences are dominating all articles published in accredited journals. Figure 5.8. below, details the proportions of journal articles published in 2006 according to the scientific disciplines.

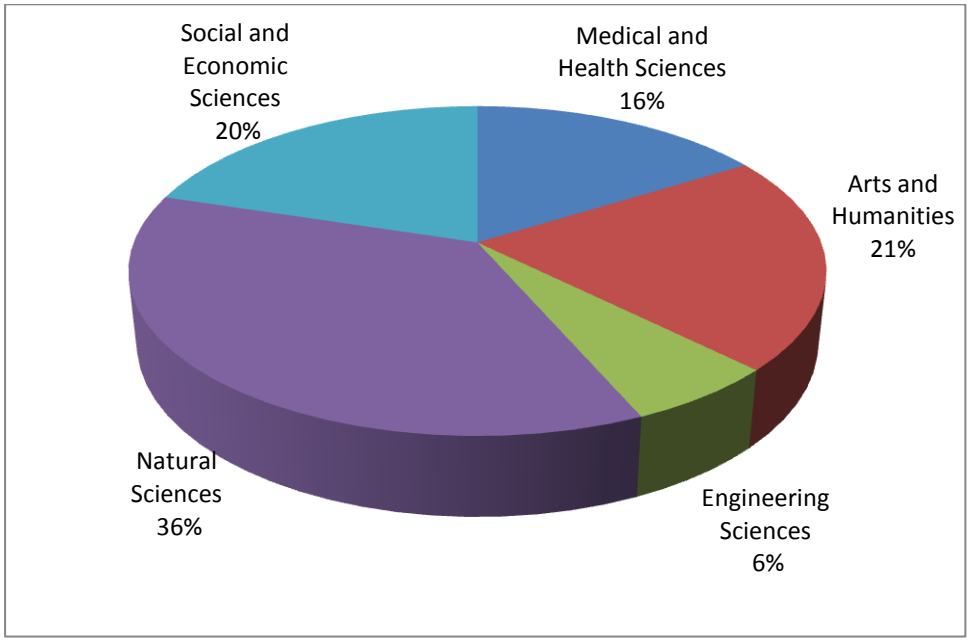


Figure 5.8. Journal articles by scientific field published in 2006

Source: HEMIS database

The natural sciences remain a leader in the publication share of journal articles, having registered 36%. The arts and human sciences are placed second with 21% while the social and economic sciences have registered 20% of the total journal articles published in 2006. There has been no significant changes in the output per field for the period under study. The

findings strongly support the hypothesis of this study in that the research component of the current higher education funding framework has had a general positive effect on knowledge production of the HEIs in South Africa. This thesis argues that the NFF strongly appears to have had a positive effect on the increasing output trend of the South African public higher education institutions for the period under study. It can be argued that the findings have also validated the research hypothesis. Furthermore, the findings can be used to evaluate Cloete's 2002 thesis in which he states:

> *While the government certainly embraced the global efficiency agenda, the SAPSE funding instrument did not result in greater research output, or improved throughputs (Cloete, 2002(a):433).*

In terms of postgraduate throughput rate as a measure of knowledge production, Inglesi and Pouris' 2008 survey of the trends in the output of science and arts graduates from 2000 to 2006 reveals that the overall character of South African universities has not changed significantly and most can be classed as predominantly arts and humanities oriented in nature.[79] There has been no significant increase in the academic capacity for the period under study.

This thesis argues that the increase in output might also be explained by or attributed to the incentives offered by HEIs for articles published in the DoE accredited journals, in line with the behavioural reinforcement theory as stated in Section 1.6. ("Theory and hypothesis") of this thesis.

Universities are said to have increased the monetary incentives for individuals who are publishing in DoE accredited journals. See Section 5.2.4. ("DoE institutional allocations and incentives"). Another suggestion to the explanation might be the increased use of visiting scholars and research

[79] Inglesi and Pouris placed universities into categories based on proportions of degrees awarded to science, engineering and technology (SET) graduates between 2000 and 2006, thus covering the periods before and after institutional mergers.

fellows to help increase outputs of HEIs. Furthermore, given that social scientists are also encouraged to pursue NRF ratings for professional prestige, an increase might to a lesser extend be credited towards a steady increase in NRF rated scientists.

This thesis argues that in the South African context, the fundamental strategy of promoting knowledge production through research (Goal 4 of the NPHE)[80] was the introduction of a separate research component in the NFF based on research outputs of HEIs. Arguably, the increase in South Africa's HEI research output between 2001 and 2006 is significant when compared with the ten year period before the introduction of the NFF . This finding confirms the hypothesis of this thesis in that the NFF strategy is yielding positive results as a new trend is observed in terms of an increase in knowledge production of HEIs and in the overall performance of researchers in South Africa.

In accordance with the NFF, the majority of the publication units are allocated for research output published in journals. It was earlier explained in Chapter 4 that consideration of the HEIs research reports by the DoE has a time lag of two years. For the 2008 reporting year, that is for output produced in 2006, the DoE (2008:3) reports that a total of 7403.61 out of the 8086.23 units were allocated for journal output in the reporting year, representing 92% of the total accredited output. This is an increase of 741.71 units from the previous year's total and represents 9.2% of the increase in the reporting year's total research output. Having looked at the units allocated for the 2006 research output, it becomes important to explain how the DoE evaluates HEIs research output.

[80] The National Plan for Higher Education (NPHE) had five basic goals one of which was: sustaining and promoting research.

5.7. Key findings on the trends of universities research output

The process of policy development and management does not end with implementation. Policy effects need to be assessed to determine whether the policy has resulted in its intended goals. Documenting the trends of HEIs knowledge production in relation to the implementation of the NFF is of fundamental importance as it relates to the monitoring and evaluation part of the policy process. Key findings from this chapter are hereby presented for analysis and usage by interested parties that include higher education managers, policy makers and the research community.

The major findings of this Chapter strongly suggest that the research component of the NFF has had positive effects on the South African HEIs knowledge production. In comparison with its predecessors that saw some fluctuations in knowledge production, the implementation of the NFF has resulted in a sharp increase in the research output of HEIs. In Figure 5.4. ("Total actual research output of South African HEIs"), a sharp increase of 14% annual growth in the research output of the HEIs since 2003 is evidenced. This thesis has argued that the introduction of the NFF is the most probable course of an increase in South Africa's HEI research output between the years 2001 and 2006. In other words, the increase in the research output, particularly between 2003 and 2006 can be directly credited to the introduction of the NFF.

The secondary findings suggest that the pressure exerted on academics to publish, that is, the notion of "publish or perish", negatively affects the quality of research outputs. Le Grange (2003:130) argues that the trivial work published might be the outcome of the pressure to produce sufficiently large numbers of publications to meet the bureaucratic requirements for the

procurement of subsidy income from the DoE or the performance appraisal systems. However, caution needs to be taken when tackling the publication quality discourse. Madue (2006:79) argues that what is perceived to be trivial by one research community might be perceived to be acceptable research by another. In this sense, the research quality discourse persists and merit further research.

For the NFF, institutions that do not reach their norm will lose money. The money that they lose will go to the institutions that have produced beyond the norm. However, institutions that produce below the norm can focus their energy on applying for the surplus funds instead of concentrating on research output.

5.8. Conclusion

In conclusion, this chapter is encored in the words of Dye (1995) when he states that:

> *Public policy does not end in the passing of legislation. It culminates in policy implementation, which involves all the activities designed to carry out policies enacted by legislature* (Dye, 1995:312).

In tacking up the policy implementation discourse further, Henry (2001:295) explains that implementation is the execution and delivery of public policies by organisations or arrangements among institutions. Although improved accountability is a major driving force behind the implementation of the NFF, there is an even more important reason: to help HEIs to improve their knowledge production.

This chapter is the crux of the thesis and it was aimed at highlighting the trends of the South African HEIs knowledge production since the inception

of the subsidy formula in 1986 until the implementation of the NFF introduced in 2001. The research question that informed this chapter is: Can we see a new trend after 2001 in higher education research output? If there is a new trend, how do we explain that?

Trends in the research output of the HEIs since 2001 (the introduction of the NFF) formed an integral part of this chapter. The findings from analysing the research output trends suggest that the NFF has had a positive influence on South African HEIs knowledge production for the period under study. In other words, the introduction of the NFF is the most probable course of an increase in research output for the reporting years of 2001 to 2006, since there is no other better explanation that has presented itself in this regard. Furthermore, in this chapter I argue that the output-driven strategy as is the case of the NFF, monitored by quality assurance indicators such as published journal articles and doctoral graduates, has more merit and is a considerable improvement on the “blind” research allocation that used to be a feature of the old subsidy formula. Whilst the NFF is recognised as having yielded its intended results, it places enormous demands on the capacity of institutions to manage and support research optimally and to maximize their potential earnings from research publications. Finally, the conclusion of this chapter being the main pillar of the thesis, leads us to a synthesis of the main findings, which are detailed in Chapter 6.

Chapter 6

Making sense of the research findings

Our view of the world is not primarily constrained by the characteristics of the world but by our ability to make sense out of it and understand it. If we see the world as unchanging, it is not because the world is inherently so but because were are not prepared to change the way we make sense out of it and understand it – Bengt Stymne 2006

6.1. Introduction

As policy analysts begin to access knowledge, they also begin the process of analysing it. The analytical process entails two aspects: (1) a daily sense-making, out of which (2) puzzles emerge (events or acts or interactions that contradict what the analyst expected, or which she cannot make sense of given what she knows at the moment, or which contradict one another (Yanow, 2003:239). Although the findings of each chapter were recorded throughout the study, this chapter is aimed at comprehensively telling a story about such findings and drawing up some proposals. In other words, this Chapter is aimed at making sense of the research findings. Wellington *et al.,* (2005:19) write that human beings are storying beings. We make sense of our lives and the things that happen to us through narratives which provide links, connections and coherence in ways that we find meaningful. As with the case of the previous chapters, this chapter addresses a specific research question. The research question that informs this chapter is: In what ways do new government policies on higher education funding impact on public higher education institutions? The starting point for this chapter is to provide a brief account of higher education policy development in the post-1994 period.

6.2. Higher education policy arena in the post-1994 South Africa

In the post-1994 period, the South African policy environment saw comprehensive policy development processes that resulted in major changes in all aspects of the citizenry. This period was characterised by a lot of transformation from the old order to the new democratic order, as discussed in Chapters 1 and 4. As far as higher education is concerned, the transformation agenda in South Africa sought to create a single co-ordinated higher education system through the *Higher Education Act, 1997 (Act No.101 of 1997)*. In line with the Higher Education Act, the new funding framework was introduced in 2001, with the aim of promoting knowledge production and increasing research output of the South African HEIs.

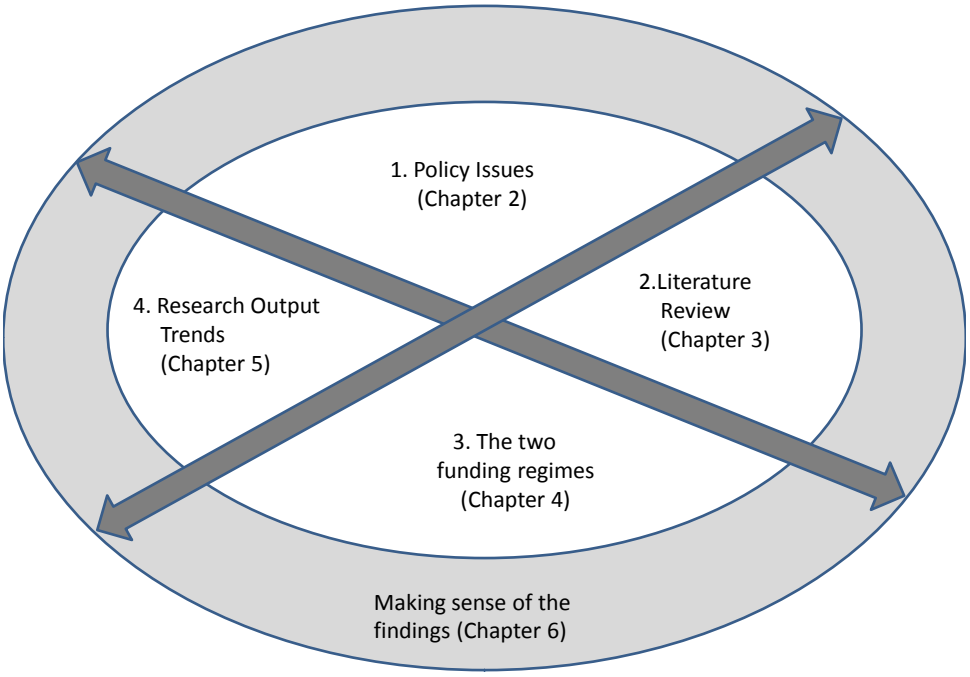
Indeed, sustaining and enhancing scholarship in South Africa is one of the primary goals of the National Plan of Higher Education, published in 2001. The DoE has not only preached the importance of research to promote scholarship, it has also put its money where its collective mouth is. South African HEIs are subsidised by the government and are therefore accountable to the society from whom the taxes are obtained. HEIs are expected to account for the funds utilised in their research endeavours. The focus of this thesis was to study the effects that the research component of the NFF has had on the knowledge production of South African HEIs between 2001 and 2006. The subsidy formula for funding HEIs research output is but an instrument that is used to assess and monitor the research output, as well as to calculate the allocation of research funding of HEIs. Therefore, a discussion on the basis for using formulas to fund higher education becomes crucial.

6.3. The basis for using funding formulas to subsidise higher education research output

Considerable public funds are spent on subsidising research funding activities at HEIs across the world, yet researchers continue to argue that more funds are needed. It would, therefore, be difficult for governments to fund or subsidise research conducted by HEIs without a formula of some kind. The norm has been to use a funding formula such as the one used to subsidise South African HEIs. While the funding formulas are differing from one country to the next, South Africa's funding system is almost similar to the British research incentive scheme, where university departments are rated according to the quantity and quality of research they produce.

The overall objective of any type of funding formula is to be transparent and encourage flexibility in the management and culture changes that universities need to make in order to remain effective, credible institutions, whilst also taking account of the variations in costing that will occur inevitably amongst different institutions. From this point, this chapter, being the second last of the thesis, provides an overview of the findings of the thesis starting from Chapter 1. The interrelationship of this chapter with other chapters of this thesis is demonstrated in Figure 6.1. below.

Figure 6.1. Chapter 6 (Making sense of the research findings)



6.4. Reflecting on Chapter 1 (Drawing the house plan – research methodology)

The essence of Chapter 1 was to outline the methodology adopted for this thesis. The chapter has explained the research problem, objectives and research questions and further outlined the hypothesis and rationale for the study. The research question for this study was concerned with the implementation of the government's new policy instrument for assessing and funding South African HEIs knowledge production. The primary research question that this study was set out to address is: what has been the effects of the research component of the new funding framework on South Africa's HEIs knowledge production for the period 2001 to 2006? In Chapter 1, a research strategy was presented as a means of guiding the approach for the remaining chapters. The following sections serve to present a synopsis of the key findings from the remaining chapters of the thesis.

6.5. Key findings emanating from Chapter 2 (… and this is where it started – policy issues)

Despite the South African government's significant achievements in the policy development arena since 1994, shortcomings in the implementation of education policies in particular and challenges of service delivery in general have fuelled criticisms with regard to the effectiveness of public policies. The effectiveness of policies largely depends on the substance of such policies as well as the ability of the government to efficiently implement them. The first key finding of this chapter is that the gap between the developed policies and their successful implementation can be a source of explanation of some of the problems that the government experiences in realising its transformation agenda.

A recommendation by Brynard (2007:364) that "not only should the South African practice of policy implementation receive attention by policy-makers, policy implementers and policy scholars, but so too should mainstream research in policy implementation", is not only relevant to Public Administration but to all policy related disciplines. Given that some government and public officials still do not understand the intricacies of the implementation process, the argument is vital for the successful delivery of public goods such as education and other public services in South Africa. Moreover, this thesis reiterates that the policy process does not end with implementation. As such, it is also necessary to trace how the policy outcomes have unfolded or the effects that the policy has had since its introduction. In other words, the second key finding of Chapter 2 is that, there is a need to trace and analyse the effects that the policy might have had on the environment it is aimed to influence. The results thereof can be used to revise or terminate the policy if it does not yield its intended outcomes.

6.6. Findings and assumptions from Chapter 3 (Literature review on knowledge production, the knowledge society and the economics of higher education)

Research has shown that there is sufficient consensus that the most prestigious resource in the "*society of knowledge*" is the human being; as such, the "producer" of knowledge, and, in the majority of cases, the processor, user, and communicator of knowledge. Knowledge is more than theoretical and practical insights. Basically, it is a reflective process, a transformative and critical activity. In Chapter 3 of this thesis, Wessels (2005:1501) is cited where he argues that not all knowledge is part of science; in other words, not all inquiries by means of methods originated in science lead to scientific knowledge. Therefore, a fundamental finding of this chapter is that "*not all knowledge can be considered to be scientific*".

A critical finding of this chapter, among others, has been the growth in the increasing importance of knowledge production in the policy arena, such as in Education, Public Administration, Political Science and Developmental Studies although the policy-makers seem not to always listen to scholarly advice. A snapshot of other findings from the literature review reveals that; (a) knowledge production plays a vital role in the purpose of a university; (b) higher education seems to be the most relevant economics of education variable, particularly in developed countries; (c) the government's funding of higher education contributes towards the university's increase of knowledge production; and (d) although comprehensive studies on higher education funding are registered, no studies on the effects of higher education funding policies have been documented, especially from a developing country context. These findings have played a major role in positioning this thesis to contribute to the knowledge base of policy studies, more especially in the disciplines of Public Administration and Education.

Numerous assumptions have been made by scholars throughout the literature review of this thesis. In summary, the five key findings of the literature review are:

(a) The production of knowledge is social process, whereby the world of policy-making and the world of research and science meet and work together in producing policy-related information, produced especially as input to the policy process;
(b) Science is a social investment in the production and dissemination of knowledge that is expected to generate economic returns as this knowledge is commercially developed and exploited;
(c) Scientific research is seen as a distinct category of public spending that requires rationalisation;
(d) If science is instrumental in technological progress and ultimately economic growth and prosperity, it follows that the economic theory and standard tools of resource allocation should be applicable to science; and
(e) For science to be analysed as a social instrument, scientific activities must be interpreted as the production of information and knowledge.

The findings from Chapter 3 have formed the basis for Chapter 4 in which a comparison between the old funding regime and the NFF was made.

6.7. Findings from Chapter 4 (Putting up the structure – A comparative analysis of the two funding regimes)

Chapter 4 has highlighted the importance of continuous reviewing of higher education funding policies. The chapter has revealed that international experience suggests that higher education institutions are able to manipulate a funding framework to their own advantage if it remains in place for too a long period.

The second finding of Chapter 4 is that, in the South African context, only six forms of research are considered subsidisable, namely (a) articles appearing in the DoE accredited journals; (b) published refereed conference proceedings; (c) scholarly books; (d) artefacts; (e) completed masters; and (e) completed PhDs. Internationally, Byrne (1996:5) argues that articles in academic journals are considered to be the most suitable form of research publication and are consequently privileged where subsidy is concerned. The privilege that articles enjoy might lead to the academics to engage in publication games and consequently publish same articles under different names in different publications. Other cases might involve researchers cutting slices from an integral piece of work that could be published in a single slice in a separate paper with the aim of increasing research output.

The third finding is that both (the old and new) South African funding regimes do not recognise undergraduate textbooks as research output. In terms of preference of journal articles over books, Higgins (2008:2) argue that since university research administrations follow the money and structure research support around journal publication rather than monograph preparation, it is not surprising that the monograph is on its way out as a form of academic production in South Africa. Again, even in the era of the NFF, the rate of subsidy for books remains considerably less than that of articles.

The fourth finding of this chapter is the absence of differentiation in subsidising HEIs. The absence of differentiation in subsidising distance and contact universities poses a challenge to academics in distance institutions. For example, study guides and undergraduate textbooks are excluded from the subsidy processes since they are not considered as research output. This suggests that academics at distance institutions (the University of South Africa in particular) are disadvantaged as they spend most of their time in producing tutorial letters, study guides and undergraduate textbooks

in comparison with the time they have to produce other forms of research output.

The final finding from Chapter 4 is that, in an attempt to increase their research output, masters' and doctoral supervisors tend to encourage their students to publish articles emanating from their masters or doctoral research results. For subsidy purposes, this is usually done through co-publication of articles by supervisors and students. A comparison of the two funding regimes has laid a foundation for the central chapter of this study where the research output trends are presented and discussed.

6.8. Findings from Chapter 5 (Roofing – higher education research output trends)

The starting point for presenting the findings from Chapter 5 is to restate the hypothesis of this study. In this Chapter I have argued by means of tracing HEIs output trends, that the NFF appears to have contributed towards an increase in the quantity of HEIs research output, especially for the reporting years of 2003 to 2006. Firstly, in comparison with its predecessors that saw some fluctuations in knowledge production, the implementation of the NFF has resulted in a sharp increase in the research output of HEIs. In its final stages, the SAPSE article output data of HEIs dropped by more than 2% over the six year period of 1995 – 2001 (from 5438 publication units in 1995 to 5311 in 2001). On the contrary, when it comes to the NFF, we saw a steady increase in the research output of the HEIs since 2003.

Secondly, of all the 23 universities, 5 elite universities continue to be at the forefront of knowledge production both in terms of research output and postgraduate throughput rates. For example, for the 2006 reporting year, the

University of Pretoria accounts for 18% of the total national research output. The trends in research output have revealed a continued predominance of 5 universities. The research capacity of South African HEIs remains concentrated in the historically white institutions. This explains the continuing dominance of the 5 universities in the total national research output. HDIs are still producing the least in research output when compared with the HWIs.

Thirdly, while the transformation of the higher education landscape has created opportunities for diversifying research strongholds, the findings of this thesis suggest that the diversification is far from being realised. The implementation of the NFF coincided with the implementation of the mergers and incorporation of HEIs in South Africa. This study did not find any correlation between the HEIs mergers (and incorporations) and the increase in knowledge production. Therefore, this thesis argues that it is the research subsidy component of the NFF that has had a positive effect on South Africa's HEIs knowledge production.

Fourthly, with regard to the quality of the research output, the pressure exerted on academics to publish, that is, the notion of "*publish or perish*", negatively affects the quality of research outputs. Le Grange (2003:130) argues that the trivial work published might be the outcome of the pressure to produce sufficiently large numbers of publications to meet the bureaucratic requirements for the procurement of subsidy income from the DoE or the performance appraisal systems. However, caution needs to be taken when tackling the quality versus quantity discourse. There is still no consensus of what should be considered a standard quality across all disciplines. For example, in the case of the natural sciences, in Philp (2009:6), Van Jaarsveld[81] argues that:

[81] Dr Albert van Jaarsveld is the acting president of the National Research Foundation in South Africa.

The quality of our research remains high, but we have been slow in terms of quantity while the rest of the world has been growing in leaps and bounds; we are running, but many other developing countries are running faster.

Lastly, incentives offered by HEIs to the outstanding researchers in terms of the numbers of their published (subsidisable) research output have an influence in the increase in knowledge production. The incentives are used to encourage the less productive researchers to compete with the productive researchers who tend to be regular recipients of research awards. Again, Posel's 2004 finding that the contribution of "ageing" scholars to current research output is substantially higher than that of younger cohorts of researchers, still holds to date. Van Jaarsveld (2009) adds that a generation of ageing researchers, poaching by the private sector, emigration and higher workloads had also contributed to the crisis. Therefore, this thesis recommends that HEIs should provide more space and time for research, especially for younger researchers. The question might be: what effects does the new practices of higher education research funding have on young researchers? This question thus provides another opportunity for policy researchers to pursue.

6.9. The effects of using the new practices in research funding

One of the interesting effects of the new practices is the creation of a more concentrated academic research. This challenges the Humboldtian idea and the academic professional ethos according to which teaching and research should go together in higher education. In practice, as research funding becomes more concentrated in a few institutions, the ability of some higher education institutions and academics to carry out research becomes more limited (Enders and Musselin, 2005). Enders and Musselin's view conforms

to the findings of this thesis as presented in Chapter 5. The findings of this thesis suggest the prevalence of a connection between higher education funding (subsidy) and knowledge production.

The subsidies allocated in earlier years by means of the SAPSE formula which were partially based on “blind research funding”, have fallen away and have become output-driven. Such an output-driven incentive scheme, conditioned by quality assurance indicators, has much merit and is a considerable improvement on the “blind” research allocation that was a feature of the old subsidy formula. The current funding framework places enormous demands on the capacity of institutions to manage and support research optimally and to maximize their potential earnings from research publications. From this point, it can be deduced that this study on the effects of the research component of the NFF has some policy implications.

6.10. Implications for policy

Policy analysts can help political actors and public agents in their efforts to estimate the chances of success of modernisation projects undertaken by the state and, more generally, the political-administrative institutions. Through the accumulation of the results of their research and expert mandates, policy analysts are able to demonstrate certain empirical consistencies (or, indeed, laws) specific to the functioning of public authorities and policies. By taking such information into account, political-administrative actors are better placed to judge the level of innovation and scope of various reforms in the course of being implemented (in particular with respect to previous experience with approaches such as the planning, programmes and budgeting system, management by objectives and zero-based budgeting) (Knopfel *et al*., 2007:xiii). The findings of this thesis can also contribute important policy analysis information that can assist policy makers in their quest for assessing policy implementation against the

intended outcomes. Empirical evidence suggests that although the NFF is output driven, the measurement of research output requires measurements along many dimensions. To date no ideal “catch all” variable for measuring research output or innovation has been developed. In many cases, multiple indicators such as journal articles, books and conference proceedings, have been used. Therefore, there is a need for a single widely accepted method applicable to all aspects of the measurement of research output.

A strong research culture, especially at the historically black institutions and universities of technology is essential to decentralise knowledge production, as it is currently dominated by the 5 elite universities. In this sense, an increase in postgraduate education capacity, particularly at Masters and PhD level will be facilitated. The impact of the NFF on higher education institutions needs to be vigorously explored and understood. The NFF’s effects on for example, the PhD throughput rate is still not yet documented. The CHE (2004:125) emphasises that understanding the extent to which funding drivers may or may not distort the research spectrum is critical to ensuring the sustainability of the National System of Innovation of which universities are a major player.

The extent to which the NFF contributes towards an increase in the PhD graduates might further lead to a substantial increase in HEIs knowledge production. The final finding of this thesis is that, to date, there is no ranking of HEIs in terms of the quality of output they produce. All the rankings throughout the world are basically quantity oriented. This study recommends that a comprehensive study on the quality of research output produced since the implementation of the NFF should be conducted to inform policy on whether the registered increase in the quantity of research output corresponds with the quality thereof.

6.11. Conclusion

This chapter, being the second last of the thesis, was aimed at presenting a comprehensive account of the findings of this thesis. Although the findings were recorded in each chapter, this chapter has provided a quick reference to the findings. The premise of this chapter and the thesis at large is: although improved accountability has been the major force behind the move by the South African government to implement the NFF for higher education, there is an even more critical reason, that is, to help institutions improve on the production of their research output.

The contribution of this thesis, therefore, was to provide a critical analysis of the trends of higher education knowledge production before and after the introduction of the NFF in 2001. The findings provide a clear picture on the performance of the HEIs in response to the implementation of the NFF. The findings on the effects that the research component of the NFF has had on South African HEIs offers institutions the opportunity to evaluate how well they are doing, to improve on their knowledge production, and to come up with more creative ways to adapt in the new institutional landscape. For the policy makers, the study has shown, by means of empirical evidence, that we can see an increase in the research output trends of HEIs since the introduction of the NFF. This means that the policy is doing well in terms of realizing its intended outcomes.

Although Chapter 6 has provided a detailed account of the main findings of each chapter, it was not meant to round off the entire thesis. A summary of the whole thesis is, therefore, outlined in Chapter 7.

Chapter 7

Conclusion – settling the dust

The purpose of this concluding chapter of the thesis is to outline a brief account of my experience of the doctoral journey. The thesis has focused on institutions that play an important role in society, that is, higher education institutions. Higher education institutions provide the human resources that manage and operate the key institutions in society – the public service, private companies and various organisations such as community based organisation and the non-governmental organisations. Higher education institutions also train educators hence it is an integral part of providing education for all in support of the concept of "a better life for all". Moreover, universities are essential institutions for generating the new knowledge that is the defining mark of modern society.

Governments increasingly turn to higher education institutions for possible solutions to pressing societal problems such as the increasing unemployment rate, finding treatments for diseases or providing models for reducing global warming. Research results of projects undertaken by higher education institutions increasingly provide the most needed input for innovation in all fields of human endeavour. Without adequate higher education institutions that provide a critical mass of skilled and educated people, no country can ensure genuine sustainable development and, developing countries cannot be able to reduce the gap that separates them from the developed ones. As such, considerable government funds are spent on financing research undertaken at higher education institutions. The aim of this thesis was to investigate the effects that the research component of the new funding framework has had on the knowledge production of higher education institutions in South Africa.

The primary hypothesis of this thesis, as formulated in Chapter 1, was that the research component of South Africa's NFF for higher education has had positive effects on the South African HEIs knowledge production. The research objectives were to answer the questions: (a) In what ways does the new 2001 government policy on higher education funding impact on public Higher Education Institutions? (b) Is the new funding policy more effective than previous policies? In other words, does the new policy improve or retard knowledge production when compared with previous policies? (c) Can we see a new trend in higher education research output after the introduction of the NFF? If there is a new trend, how do we explain that? A research strategy was presented in Chapter 1 as a means for cementing the foundation for the remaining chapters. Chapter 1 was therefore, mainly focused on the research methodology adopted for this study.

Chapter 2 was devoted to aligning the key concepts of the study. The chapter served to ideologically position the research project as well as to outline the contribution of this study to the research community. The emphasis was on identifying the gap between policy making and policy implementation more especially in the South African context. The working definitions of policy and policy analysis were provided from the international Public Administration arena and further narrowed down to the South African perspective. Furthermore, Chapter 2 has emphasized that policy analysis cuts across all scientific disciplines. Waldavsky (1979) in Knopfel *et al*., (2007:3) argues that policy analysis is an applied subfield whose contents cannot be determined by disciplinary boundaries but by whatever appears appropriate to the circumstances of the time and the nature of the problem. The conceptual framework provided in this chapter has contributed towards positioning this study in the context of public policy analysis. Accordingly, the chapter was started by outlining policy change in South Africa since 1994, a period that has been characterised as transition from the old dispensation to the new democratic government.

Despite the South African government's significant achievements in policy development since 1994, shortcomings in the implementation of policies (particularly in education) and challenges of service delivery have fuelled criticisms with regard to the effectiveness of public policies. The standard conclusion of Chapter 2 is that, the effectiveness of policies largely depends on the substance of such policies as well as the ability of the government to efficiently implement them. It was concluded that the gap between the developed policies and their successful implementation can be a source of explanation of some of the problems that the government experiences in realising its transformation agenda.

Chapter 3 was set out to explore literature on knowledge production on the one hand and the economics of higher education on the other hand. The purpose of the literature review for this study was to establish what is already known about the effects of higher education funding frameworks (with special emphasis on knowledge production, economics of higher education, and higher education funding frameworks), to investigate the empirical claims of this published literature and, to identify the weaknesses or limitations of this knowledge.

The scholarship on which the literature review was based comes from diverse subjects including Public Administration, Education, Economic Sciences, Information Technology, Engineering, Law and Social Sciences. The literature review in this chapter has provided a framework for establishing the importance of the study, as well as a benchmark for comparing the results of the study with other findings. The review has presented a background on the higher education framework, especially from the South African perspective and, traced methodologies and history of measuring higher education research and knowledge productivity.

In terms of the economics of higher education, the high social rates of return indicate that investment in education is a profitable investment for the state. This means that an argument can be made in favour of increased public expenditure on higher education. Moreover, in higher education economics, knowledge is viewed as "*a public good*". That is, knowledge is a non-excludable good; in other words, it is difficult to make it exclusive or to control it privately. The belief in South Africa that higher education is a basic right assumes that education is a public good. As a public good, knowledge production in higher education is financed by the government through the subsidy formula. Governments are constantly searching for evidence that they are receiving high returns on their investment in higher education. This has culminated in the introduction of higher education funding frameworks.

The system of funding higher education has undergone a series of gradual but significant changes in recent years, which have encompassed the systems both of central funding for universities and of financial support for individual students. This literature review has only concentrated on the central funding of universities through research funding. The literature review has revealed that while the funding framework in South Africa was initiated in 1982, it was only in 2001 that the Ministry of Education proposed and introduced the NFF in response to the imperatives of the *Higher Education Act (Act 101 of 1997)*. The NFF purports to provide incentives for institutions to become efficient, namely by subsidising the outputs of research.

The literature review has revealed that policy debates are relatively silent on the relationship between the NFF and its possible effects on HEIs knowledge production. In summary, this thesis is arguably the first form of literature to study the relationship between South Africa's NFF and higher education knowledge production trends. The lesson learned from the literature review is that the researcher needs to critically analyse various

conflicting views while at the same time making a meaningful contribution to the current discourse. A mere reproduction of what other authors have said does not translate into a scholarly literature review from which one's research study can be anchored.

Chapter 4 has examined the complex relationship between the current South African higher education funding policy and its predecessors within the context of the international debate on the subject of knowledge production. In this chapter, a detailed background of the funding policy framework that led to the enactment of the new higher education funding policy in South Africa was presented. A comparison of the previous and current government policies was conducted to highlight the discourse on policy changes and continuities as discussed in Chapter 2. The purpose of this chapter was to illuminate the similarities and identify major differences between previous policies and the current policy, in relation with the effects that such policies have had on knowledge production.

In Chapter 4, I have argued that while there are some improvements in the new funding regime, there are striking similarities (in the form of shortcomings) that the framework has with its predecessors. Shortcomings of both the old and the funding regimes include; (a) the omission of research that is not published as may occur with some kinds of commissioned research but also with papers delivered at conferences and seminars; (b) research which goes towards attainment of higher degrees; and (c) some research material which is not considered true research by the DoE. The latter category includes text books and book reviews.

The differences between the current funding regime and the previous policies can be used by HEIs to leverage their research output, improve their annual output production as the NFF recognises the move towards

electronic publications and the recognition of patents and artefacts as research output. In conclusion, a major finding from the comparative analysis is that the development of the NFF for HEIs in South Africa was necessary as its predecessors, which were introduced in the early 1980s, could not be used to address the current national goals and objectives.

In Chapter 5, the trends in knowledge production of South African HEIs as well as in the application of the NFF were highlighted. The chapter was aimed at answering the research question: Can we see a new trend after 2001 in higher education research output? If there is a new trend, how do we explain that? The purpose of this chapter was to trace the differential impact that the current higher education funding framework has on knowledge production of South African HEIs. An overview of the world output trends was provided before concentration was given to the South African HEIs trends, with a special emphasis on the years 2001 to 2006. This Chapter served to confirm the hypothesis of this thesis in that the main finding has revealed that the NFF framework has had positive effects on the knowledge production of HEIs. That is, there is a strong correlation between the introduction of the NFF and the increase in HEIs knowledge production as measured by the research output.

A steady increase in HEIs knowledge production continues to be registered since the implementation of the NFF. The remarkable growth in knowledge production can thus be attributed to successful implementation of the NFF. However, using the empirical data for the reporting years of 2001 to 2006, it cannot be fully argued that the NFF is more effective that its predecessors. Therefore, this thesis recommends continuous research in this regard whereby a longitudinal study (for example, a 10 year review of the NFF) can be conducted to make a more comprehensive comparative analysis of the NFF and its predecessor that has had a 20 years lifespan. Perhaps a 10 year review may bring a different result on the effects that the NFF has on HEIs knowledge production.

The thesis was concluded in Chapter 6 in which an analysis of the major findings was presented. The chapter has narrated a story on the findings of each chapter and related them to the research questions formulated in Chapter 1. An attempt was made to further explain the findings while at the same time providing a brief summary of the major findings for easy reference. Some major assumptions were also highlighted in this chapter. The two striking assumptions are: (a) Knowledge production is a social process, whereby the world of policy-making and the world of research and science meet and work together in producing policy-related information, produced especially as input to the policy process; and (b) funding higher education (as a public good) is a social investment in the production and dissemination of knowledge that is expected to generate economic returns as this knowledge is commercially developed and exploited.

Chapter 6 has also highlighted some of the effects of adopting new funding practices around the world. The implications of this study for the policy arena formed the concluding remarks of Chapter 6. One such implication is that a strong research culture, especially at the historically black institutions and universities of technology in South Africa, is essential to decentralise knowledge production, as it is currently dominated by the 5 "elite" universities, even after the introduction of the NFF. The chapter further recommends the need to vigorously explore and understand the impact of the NFF on South African HEIs, especially on student financing and the postgraduate throughput rates.

The significance of this study is hereby highlighted to conclude this thesis. The study on the effects of the research component of the NFF on HEIs in South Africa contributes to the empirical literature on the impact of new funding drivers on higher education knowledge production.[82] The mechanism by which higher education institutions receive their funding

[82] Also see "Critical issues and challenges ahead" in Chapter 13 of the CHE (2004).

allocation has a powerful influence on their internal resource allocation models. Changes in evaluation and patterns of funding have an impact on the balance between academic and supporting activities and the composition of academic activities. In conclusion, this thesis adds to the knowledge base of policy studies and the implementation of higher education funding policies thorough a critical analysis of the two funding regimes as well as the highlighted trends in knowledge production of South African higher education institutions since 1986. A special emphasis was put on the knowledge production trends of the period 2001 to 2006.

In South Africa, higher education funding is greatly influenced by research output. This thesis has argued that there is a positive relation between a significant increase in HEIs knowledge production (as proxied by the research output) and the introduction of the NFF in 2001. This relation is proven through the presentation of the empirical data with a steep slope as seen in Figure 5.4. that closely agrees with the hypothesis as stated in Section 1.6. Since the thesis will also be of assistance to masters' and doctoral candidates, I would like to close this chapter by highlighting my experience through the doctoral journey.

The road to completing a doctoral degree is both challenging and fulfilling. Wellington *et al*., (2005:30) stress that:

> *The doctoral journey is a long and often arduous one. It leads not only through a particular field of research but sometimes enters a wilderness where nothing seems to make sense; or a desert where ideas simply dry up; or even places where relationships become difficult with "significant others" who play a part in the journey. At the end of it, like anyone who has travelled for a long period, those who undertake this journey will have been affected and changed by it.*

To start with, you need to have solid reasons and clear aims for embarking on a doctoral journey. Being clear about your hopes and aims can help in deciding if a doctorate is, indeed, the most appropriate course for you, and can also be a useful touchstone and motivator to refer to if enthusiasm saps. As a journey, a doctoral studies is mostly a lonely and unique journey; it is difficult to have someone to come along and share the journey, or to offer you a clear cut navigation on how to get there nor an account of what to encounter along the way. It is therefore, ideal to have constant conversations with those who have travelled the road as a way of encouraging yourself, particularly when travelling through tough trails. It is never a smooth ride.

Another factor to consider is that writing an acceptable research proposal needs long hours of preliminary literature study which in itself is not free from frustration, exhaustion and confusion. I have read contradictory articles and books, especially on knowledge production and the concept of a university, which made it difficult for me to decide on the relevant research topic. This has led to coining numerous research topics and rephrasing them several times before arriving to a more workable topic. Reading relevant theses and dissertations in the subjects of Public Administration and Education Management has greatly assisted in coming up with a more acceptable research topic. A thesis worth mentioning is that of Prof Anthony Melck's, written in 1982, in which he has studied the methods of financing universities in South Africa.

Coming up with an acceptable research topic is a challenging task which might explain why some candidates take up to two to three years before their topics are finally approved by the research committees. My experience in the higher education research environment has assisted me in persevering until I became convinced that my chosen topic has greater possibilities of being accepted as is. Unlike other doctoral candidates, I have spent one year writing up my research proposal before applying for

registration at the university. Yet, on my submission of the application which was accompanied by a detailed research proposal, the research topic was accepted with some amendments. The promoters appointed to serve as my mentors have greatly contributed towards the finalization of a more acceptable research topic for this thesis. The research topic as it stands is the result of three amendments.

On the research question and the objectives as is the case of the research topic, the use of guidelines and manuals for writing research proposals has played a vital role in shaping up the entire proposal. While acknowledging numerous sources I have consulted in this regard, three sources worth noting are: Auriacombe, 2001; Vithal and Jansen, 1997; Mouton, 2001. In the Department of Public Administration and Management of the University of South Africa, all candidate doctors receive Auriacombe's guide as part of their study packages. In addition, the constructive criticisms by my promoters, although they were sometimes difficult to accept, have resulted in the shaping and reshaping of my research questions. The lesson I have learned in this regard is to accept criticisms no matter how challenging those criticisms are. Criticisms are vital in the process of becoming an academic and a researcher of note.

With regard to writing up the thesis, I have learned to write concisely and to the point. While Sims (2006:40) explains that writing is the means by which we show our workings, Mouton (2001:129) cautions that some students believe – mistakenly – that writing scientifically means writing long and complex sentences. I have also fallen in this trap several times along this journey. My promoters have often requested me to shorten my sentences and cut out some paragraphs. When re-reading the sentences concerned, I often struggled to make sense of what I have written. Mauer (1996:382) notes that:

> *Sentences are meant to convey meaning – they are not treasures to be retained at all costs. A sentence that confuses the writer is bound to confuse readers as well*.

Mauer further advises us to be ruthless about our own writing. We need to change our sentences until they say exactly what we intend them to say.

Another difficulty I have experienced in writing up the thesis was writing scientifically in English since English is my second language. Mouton (2001:132-133) correctly states that most scholars and postgraduate students at South African universities do not have English as their home language. Writing in English, especially "scientific" English does not come naturally. The lesson I have learned was to read my work over and over again until I can make sense of what I have written. Sims (2006:40) writes that re-reading and improving our own material is a core activity for academics, and one of the hardest tasks for may. This is partly because it is less interesting than much of our reading.

Proofreading my own work was a difficult exercise. It has required more time than I had anticipated. It was not easy to spot mistakes when proofreading. However, in revising my work, I was encouraged by the words of Sims (2006) when he states:

> *As we revise our work, we are not a static thinker revising a fixed document. We are learning at the same time as revising. We are continuing the process of thinking about our topic while revisiting the text that we wrote. So writing does not only reflect our thinking, it constitute it (Sims, 2006:41).*

Wellington *et al*., (2005:150) reminds us that reading your own work is important but is no substitute for having another eye on it, first perhaps from a critical friend, then your supervisor and later (if possible) from an "outsider". In order to compliment my proofreading, I have also asked my friends and colleagues to critically read some portions of the thesis. The use of word processors for editing and grammar check has also assisted in rephrasing and fine-tuning the text. Finally, the thesis was send to the language editor not only as a prerequisite for final submission but for assisting with the professional presentation.

I would like to conclude by stressing that it is important to develop a listening skill. Listening to your promoters and those who have travelled the road before me has helped a lot in constructing this thesis. However, I would like to close in my promoters' wise words when they state that:

> *Your research journey is not the responsibility of your promoters. Do it yourself and you will be fulfilled by the fruits of your labour.*

Annexure 1: Funding of research output by the DoE

TABLE 2: FUNDING OF RESEARCH OUTPUT FOR 2004/05

HIGHER EDUCATION INSTITUTION	Inst code	NORMED RESEARCH OUTPUT FOR 2002			ACTUAL RESEARCH OUTPUT FOR 2002						RESEARCH OUTPUT GRANTS FOR 2004/05			PER CAPITA GRANT		
		headcount permanent Instr/ research staff	Weighted research units per perma-nent Instr/ research staff	Expected research output according to norm	Research publica-tions	GRADUATES Research Masters	GRADUATES Docto-rates	Weighted research output	Delivery propor-tion (%)	Shortfall in output	Actual research output	Research develop-ment (surplus)	TOTAL	Actual research output	Research develop-ment (surplus)	TOTAL
		(A)	(B)	C=(AxB)				(D)	(E) = (D/C)	(F) = (C - D)	(G)=D* (J)total/(C)total (R'000)	(H) = (J-G)total* (F/Ftotal) (R'000)	(J) = (G+H) (R'000)	(G/D) (Rand)	(H/D) (Rand)	(J/D) (Rand)
Weightings					1.0	1.0	3.0									
UNIVERSITIES	**Inst**	**11 137**		**13 921**	**5 604**	**3 055**	**964**	**11 551**	**83.0%**	**3 969**	**822 330**	**198 064**	**1 020 394**	**71 189**	**49 903**	**65 746**
CAPE TOWN	101	673	1.25	841	710	252	109	1 289	153.2%	0	91 759	0	91 759	71 189	0	71 189
DURBAN WESTVILLE	102	351	1.25	439	127	67	26	271	61.8%	167	19 313	8 356	27 670	71 189	49 903	63 065
FORT HARE	103	183	1.25	229	55	4	2	65	28.6%	163	4 656	8 151	12 808	71 189	49 903	55 989
MEDUNSA	104	414	1.25	518	37	26	3	72	14.0%	445	5 145	22 218	27 363	71 189	49 903	52 876
NATAL	105	1 018	1.25	1273	567	223	72	1 006	79.0%	267	71 606	13 307	84 912	71 189	49 903	66 729
NORTH	106	343	1.25	429	73	8	0	81	18.8%	348	5 740	17 372	23 112	71 189	49 903	53 906
NORTH WEST	120	204	1.25	255	12	7	0	19	7.6%	236	1 374	11 762	13 136	71 189	49 903	51 515
FREE STATE	107	587	1.25	734	366	232	79	835	113.8%	0	59 422	0	59 422	71 189	0	71 189
PORT ELIZABETH	108	248	1.25	310	106	50	20	215	69.4%	95	15 320	4 731	20 051	71 189	49 903	64 680
POTCHEFSTROOM	109	532	1.25	665	210	281	59	668	100.4%	0	47 549	0	47 549	71 189	0	71 189
PRETORIA	110	1 321	1.25	1651	954	648	153	2 061	124.8%	0	146 717	0	146 717	71 189	0	71 189
RAU	111	406	1.25	508	267	217	70	695	136.9%	0	49 473	0	49 473	71 189	0	71 189
RHODES	112	343	1.25	429	207	125	41	455	106.1%	0	32 382	0	32 382	71 189	0	71 189
STELLENBOSCH	114	789	1.25	986	634	450	109	1 410	143.0%	0	100 410	0	100 410	71 189	0	71 189
TRANSKEI	119	189	1.25	236	11	4	2	21	8.9%	215	1 494	10 742	12 236	71 189	49 903	51 794
UNISA	113	1 058	1.25	1323	392	171	70	772	58.4%	550	54 989	27 450	82 439	71 189	49 903	62 336
VENDA	121	275	1.25	344	14	2	0	16	4.7%	328	1 141	16 355	17 495	71 189	49 903	50 895
VISTA	118	441	1.25	551	59	11	14	112	20.3%	439	7 967	21 924	29 891	71 189	49 903	54 224
WESTERN CAPE	115	444	1.25	555	114	77	17	241	43.5%	314	17 185	15 650	32 835	71 189	49 903	59 161
WITWATERSRAND	116	1 054	1.25	1318	633	141	97	1 065	80.8%	253	75 791	12 618	88 409	71 189	49 903	67 104
ZULULAND	117	264	1.25	330	58	60	21	181	54.9%	149	12 896	7 428	20 324	71 189	49 903	61 588
TECHNIKONS		**3 758**		**1 879**	**224**	**204**	**24**	**500**	**26.6%**	**1 379**	**35 603**	**68 810**	**104 413**	**71 189**	**49 903**	**55 569**
BORDER	313	147	0.5	74	5		0	5	6.8%	69	356	3 418	3 774	71 189	49 903	51 351
CAPE	301	332	0.5	166	11	12	4	34	20.8%	132	2 453	6 564	9 017	71 189	49 903	54 321
EASTERN CAPE	315	181	0.5	91	0		0	0	0.0%	91	0	4 516	4 516	0	49 903	49 903
FREE STATE	306	138	0.5	69	20	13	4	45	64.6%	24	3 171	1 221	4 391	71 189	49 903	63 643
M L SULTAN	304	275	0.5	138	12	13	0	25	18.1%	113	1 767	5 623	7 390	71 189	49 903	53 746
MANGOSUTHU	303	141	0.5	71	1		0	1	1.9%	69	96	3 451	3 547	71 189	49 903	50 311
NATAL	305	344	0.5	172	14	51	1	68	39.5%	104	4 834	5 195	10 029	71 189	49 903	58 307
NORTH WEST	314	97	0.5	49	5		0	5	9.8%	44	338	2 183	2 521	71 189	49 903	51 988
NORTHERN GAUTENG	302	231	0.5	116	1	0	0	1	0.9%	115	71	5 714	5 785	71 189	49 903	50 087
PENINSULA	307	203	0.5	102	4	11	1	17	17.2%	84	1 242	4 194	5 437	71 189	49 903	53 563
PORT ELIZABETH	308	258	0.5	129	30	30	3	69	53.3%	60	4 898	3 004	7 902	71 189	49 903	61 256
PRETORIA	309	525	0.5	263	70	43	9	139	53.1%	123	9 920	6 146	16 066	71 189	49 903	61 203
SA	310	186	0.5	93	24	8	1	35	37.7%	58	2 499	2 889	5 388	71 189	49 903	57 937
VAAL TRIANGLE	311	312	0.5	156	16	3	1	22	14.0%	134	1 553	6 696	8 249	71 189	49 903	52 880
WITWATERSRAND	312	388	0.5	194	13	21	0	34	17.4%	160	2 404	7 996	10 400	71 189	49 903	53 608
TOTAL		14 895		15 800	5 828	3 259	988	12 051	76.3%	5 348	857 933	266 874	1 124 807	71 189	49 903	64 647

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TABLE 3: FUNDING OF RESEARCH OUTPUT FOR 2005/06

HIGHER EDUCATION INSTITUTION	Inst code	NORMED RESEARCH OUTPUT FOR 2003			WEIGHTED NORMED RESEARCH OUTPUT				ACTUAL RESEARCH OUTPUT FOR 2003						RESEARCH OUTPUT GRANTS FOR 2005/06			PER CAPITA GRANT		
		headcount permanent instr/ research staff (Table 3.3)	Weighted research units per perma-nent instr/ research staff	Expected research output according to norm	2002	2003	Increase	Capped 2003	Research publica-tions	GRADUATES (Table 2.13) Research Masters	Doctor-rates	Weighted research output	Delivery propor-tion (%)	Shortfall in output	Actual research output	Research develop-ment	TOTAL	Actual research output	Research develop-ment	AVERAGE TOTAL
		(A)	(B)	C'=(AxB)	(C)	(C')	(%)	(C)				(D)	(E) = (D/C)	(F) = (C - D)	(G)=D' (J/total)(C/total (R'000)	(H) = (J-G)/total' (F/Ftotal) (R'000)	(J) = (G+H) (R'000)	(G/D) (Rand)	(H/D) (Rand)	(J/D) (Rand)
Weightings									1.0	1.0	3.0									
UNIVERSITIES	**Inst**	**11 288**		**14 079**	**14 026**	**14 079**	**0.4%**	**13 811**	**6 881**	**3 218**	**1 024**	**11 881**	**86.8%**	**3 380**	**908 667**	**180 461**	**1 087 007**	**77 609**	**53 700**	**72 287**
CAPE TOWN	101	779	1.25	974	944	974	3.2%	944	564	316	103	1 189	125.9%	0	92 242	0	92 242	77 609	0	77 609
DURBAN WESTVILLE	102	345	1.25	431	439	431	-1.7%	431	74	106	46	318	73.7%	114	24 659	6 096	30 755	77 609	53 700	71 315
FORT HARE	103	190	1.25	238	229	238	3.8%	283	79	13	3	100	35.5%	182	7 790	9 780	17 570	77 609	53 700	62 195
MEDUNSA	104	413	1.25	516	518	516	-0.2%	516	50	14	8	89	17.1%	428	6 870	22 969	29 839	77 609	53 700	57 799
NATAL	105	1058	1.25	1323	1 273	1 323	3.9%	1 273	630	368	89	1 265	99.4%	8	98 157	416	98 572	77 609	53 700	77 464
NORTH	106	342	1.25	428	429	428	-0.3%	428	63	14	2	84	19.6%	344	6 506	18 455	24 961	77 609	53 700	58 388
NORTH WEST	120	184	1.25	230	255	230	-9.8%	230	1	26	4	39	17.2%	191	3 062	10 232	13 294	77 609	53 700	57 802
FREE STATE	107	517	1.25	646	734	646	-11.9%	646	334	225	84	811	125.6%	0	62 979	0	62 979	77 609	0	77 609
PORT ELIZABETH	108	267	1.25	334	310	334	7.7%	310	123	98	23	290	93.5%	20	22 493	1 084	23 576	77 609	53 700	76 053
POTCHEFSTROOM	109	531	1.25	664	665	664	-0.2%	664	266	224	88	754	113.6%	0	58 534	0	58 534	77 609	0	77 609
PRETORIA	110	1524	1.25	1905	1 651	1 905	15.4%	1 651	964	464	146	1 856	112.4%	0	144 049	0	144 049	77 609	0	77 609
RAU	111	432	1.25	540	509	540	6.1%	509	277	240	92	793	156.0%	0	61 579	0	61 579	77 609	0	77 609
RHODES	112	334	1.25	418	429	418	-2.6%	364	165	87	27	333	91.5%	31	25 820	1 668	27 488	77 609	53 700	75 567
STELLENBOSCH	114	809	1.25	1011	986	1 011	2.5%	955	624	438	111	1 395	146.1%	0	108 276	0	108 276	77 609	0	77 609
TRANSKEI	119	170	1.25	213	236	213	-10.1%	213	14	4	1	21	9.9%	191	1 632	10 282	11 914	77 609	53 700	56 066
UNISA	113	1090	1.25	1363	1 323	1 363	3.0%	1 323	403	134	76	765	57.9%	557	59 391	29 924	89 315	77 609	53 700	67 535
VENDA	121	268	1.25	335	344	335	-2.5%	335	24	16	3	49	14.6%	286	3 796	15 363	19 159	77 609	53 700	57 190
VISTA	118	430	1.25	538	551	538	-2.5%	538	21	7	5	42	7.9%	495	3 278	26 595	29 873	77 609	53 700	55 579
WESTERN CAPE	115	448	1.25	560	555	560	0.9%	586	106	124	28	314	53.6%	272	24 371	14 619	38 989	77 609	53 700	66 507
WITWATERSRAND	116	890	1.25	1113	1 318	1 113	-15.6%	1 113	557	270	73	1 046	94.0%	67	81 176	3 573	84 749	77 609	53 700	76 179
ZULULAND	117	242	1.25	303	330	303	-8.3%	303	61	31	12	128	42.2%	175	9 897	9 396	19 293	77 609	53 700	63 779
TECHNIKONS		**3 718**		**1 867**	**1 879**	**1 867**	**-1.2%**	**1 821**	**200**	**226**	**28**	**639**	**35.8%**	**1 282**	**41 796**	**68 841**	**110 636**	**77 609**	**53 700**	**60 772**
BORDER	313	146	0.5	73	74	73	-0.7%	73	7	0	0	7	9.3%	66	528	3 555	4 083	77 609	53 700	55 927
CAPE	301	345	0.5	173	166	173	3.9%	166	20	21	4	53	32.2%	113	4 145	6 046	10 191	77 609	53 700	61 392
DIT	316	544	0.5	272	310	272	-12.1%	272	27	37	3	72	26.5%	200	5 600	10 732	16 331	77 609	53 700	60 042
EASTERN CAPE	315	173	0.5	87	91	87	-4.4%	87	0	0	0	0	0.0%	87	0	4 645	4 645	0	53 700	53 700
FREE STATE	306	145	0.5	73	69	73	5.1%	69	21	18	7	61	87.7%	8	4 695	456	5 152	77 609	53 700	74 664
MANGOSUTHU	303	147	0.5	74	71	74	4.3%	71	6	0	0	6	8.4%	65	462	3 466	3 928	77 609	53 700	55 718
NORTH WEST	314	107	0.5	54	49	54	10.3%	49	8	1	0	9	18.1%	40	683	2 132	2 815	77 609	53 700	58 037
NORTHERN GAUTENG	302	227	0.5	114	116	114	-1.7%	114	4	2	1	10	8.5%	104	745	5 580	6 324	77 609	53 700	55 721
PENINSULA	307	214	0.5	107	102	107	5.4%	102	12	18	1	33	32.9%	68	2 592	3 657	6 249	77 609	53 700	61 567
PORT ELIZABETH	308	248	0.5	124	129	124	-3.9%	124	32	45	5	92	74.6%	32	7 177	1 693	8 870	77 609	53 700	71 529
PRETORIA	309	550	0.5	275	263	275	4.8%	263	60	53	4	124	47.3%	138	9 637	7 428	17 065	77 609	53 700	65 009
SA	310	176	0.5	88	93	88	-5.4%	88	11	0	0	11	13.0%	77	885	4 113	4 998	77 609	53 700	56 797
VAAL TRIANGLE	311	308	0.5	154	156	154	-1.3%	154	5	4	3	17	11.3%	137	1 349	7 336	8 685	77 609	53 700	56 398
WITWATERSRAND	312	383	0.5	192	194	192	-1.3%	192	16	27	0	43	22.2%	149	3 298	8 001	11 300	77 609	53 700	59 006
TOTAL		**14 978**		**16 936**	**16 904**	**16 936**	**0.2%**	**16 482**	**6 821**	**3 442**	**1 052**	**12 220**	**78.2%**	**4 642**	**948 361**	**248 292**	**1 197 643**	**77 609**	**53 700**	**71 028**

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TABLE 4: FUNDING OF RESEARCH OUTPUT FOR 2006/07

HIGHER EDUCATION INSTITUTION	Inst code	NORMED RESEARCH OUTPUT FOR 2004						ACTUAL RESEARCH OUTPUT FOR 2004						RESEARCH OUTPUT GRANTS FOR 2006/07			PER CAPITA GRANT		
		Headcount of permanently instr/research staff (Table 3.3)				Weighted research units per permanent instr/ research staff	Weighted research output according to norm	Research publications 6)	GRADUATES (Table 2.13) Research Masters	GRADUATES (Table 2.13) Doctorates	Weighted research output	Delivery proportion (%)	Shortfall in output	Actual research output	Research development	TOTAL	Actual research output	Research development	Average Total
		2002 1)	2003 2)	2004 3)	Smallest of 2002, 2003 and 2004 (A)	(B)	C=(AxB)				(D)	(E) = (D/C)	(F) = (C - D)	(G)=D*(J/total)/(C/total (R'000)	(H) = (J-G)total* (F/Ftotal) (R'000)	(J) = (G+H) (R'000)	(G/D) (Rand)	(H/D) (Rand)	(J/D) (Rand)
Weightings								1.0	1.0	3.0									
BORDER	313	147	146	147	146	0.5	73.00	5.25	0.000	0	5.250	7.2%	67.75	427	3 059	3 486	81 276	45 152	47 750
CAPE (tech)	301	332	345	372	332	0.5	166.00	25.55 5)	18.000	1	46.550	28.0%	119	3 783	5 393	9 177	81 276	45 152	55 282
CAPE TOWN	101	755	779	812	755	1.25	943.75	756.69	318.483	99	1 372.173	145.4%	0	111 525	0	111 525	81 276	0	81 276
CENTRAL UT	306	138	145	202	202 4)	0.5	101.00	28.99	15.500	7	65.490	64.8%	36	5 323	1 603	6 926	81 276	45 152	68 575
DIT	316	619	544	538	538	0.5	269.00	22.68	40.000	3	71.680	26.6%	197	5 826	8 909	14 735	81 276	45 152	54 778
EASTERN CAPE	315	181	173	207	173	0.5	86.50	0.00	0.000	0	0.000	0.0%	87	0	3 906	3 906	0	45 152	45 152
FORT HARE	103	238	233	239	233	1.25	291.25	44.61	0.000	2	50.610	17.4%	241	4 113	10 865	14 979	81 276	45 152	51 429
FREE STATE (uni)	107	587	517	578	578 4)	1.25	722.50	359.65	199.840	58	733.490	101.5%	0	59 615	0	59 615	81 276	0	81 276
KWAZULU-NATAL	H08	1 369	1 403	1 391	1 369	1.25	1 711.25	716.35	371.068	98	1 381.418	80.7%	330	112 276	14 893	127 169	81 276	45 152	74 313
MANGOSUTHU	303	141	147	147	141	0.5	70.50	4.50	0.000	0	4.500	6.4%	66	366	2 980	3 346	81 276	45 152	47 458
MEDUNSA	104	414	413	434	413	1.25	516.25	69.20	0.000	6	87.200	16.9%	429	7 087	19 372	26 460	81 276	45 152	51 254
NORTH	106	343	342	351	342	1.25	427.50	45.32	0.000	14	87.320	20.4%	340	7 097	15 360	22 457	81 276	45 152	52 531
NORTH WEST	H11	736	715	758	758 4)	1.25	947.50	275.05	262.236	87	798.286	84.3%	149	64 882	6 737	71 619	81 276	45 152	75 587
PENINSULA	307	203	214	217	203	0.5	101.50	15.33 5)	23.000	1	41.330	40.7%	60	3 359	2 717	6 076	81 276	45 152	59 861
PORT ELIZABETH (tech)	308	258	248	238	238	0.5	119.00	20.60	37.000	9	84.600	71.1%	34	6 876	1 553	8 429	81 276	45 152	70 833
PORT ELIZABETH (uni)	108	248	267	338	338 4)	1.25	422.50	132.40	96.918	26	307.318	72.7%	115	24 978	5 201	30 178	81 276	45 152	71 428
PRETORIA	110	1 321	1 524	1 574	1 574 4)	1.25	1 967.50	1 061.98	531.560	187	2 154.540	109.5%	0	175 113	0	175 113	81 276	0	81 276
RAU	111	407	432	556	556 4)	1.25	695.00	371.37 5)	273.000	95	929.370	133.7%	0	75 536	0	75 536	81 276	0	81 276
RHODES	112	288	291	298	288	1.25	360.00	209.20	86.500	40	415.700	115.5%	0	33 786	0	33 786	81 276	0	81 276
SOUTH AFRICA	H14																		
UNISA	113	1 058	1 090	1 162	1 162 4)	1.25	1 452.50	492.12	135.970	95	913.090	62.9%	539	74 212	24 355	98 568	81 276	45 152	67 861
Tech SA	310	186	176	168	168	0.5	84.00	21.31	0.000	1	24.310	28.9%	60	1 976	2 695	4 671	81 276	45 152	55 606
STELLENBOSCH	114	765	784	778	765	1.25	956.25	849.99	495.989	115	1 690.979	176.8%	0	137 436	0	137 436	81 276	0	81 276
TRANSKEI	119	189	170	161	161	1.25	201.25	12.35	0.000	0	12.350	6.1%	189	1 004	8 529	9 533	81 276	45 152	47 369
TUT	H16	853	884	896	853	0.5	426.50	79.52	54.500	9	161.020	37.8%	265	13 087	11 987	25 074	81 276	45 152	58 790
VAAL UT	311	312	308	313	308	0.5	154.00	4.74	6.000	2	16.740	10.9%	137	1 361	6 198	7 558	81 276	45 152	49 079
VENDA	121	275	268	271	268	1.25	335.00	18.62	1.000	3	28.620	8.5%	306	2 326	13 834	16 160	81 276	45 152	48 238
WESTERN CAPE	115	468	473	480	468	1.25	585.00	152.22	134.000	23	355.220	60.7%	230	28 871	10 375	39 246	81 276	45 152	67 087
WITWATERSRAND (tech)	312	388	383	388	383	0.5	191.50	15.70 5)	15.000	0	30.700	16.0%	161	2 495	7 260	9 756	81 276	45 152	50 943
WITWATERSRAND (uni)	116	1 054	890	1 186	890	1.25	1 112.50	791.62	282.733	93	1 353.353	121.6%	0	109 995	0	109 995	81 276	0	81 276
ZULULAND	117	264	242	210	210	1.25	262.50	57.33	20.000	29	164.330	62.6%	98	13 356	4 433	17 789	81 276	45 152	67 766
ALL INSTITUTIONS		**14 637**	**14 648**	**15 409**	**14 818**		**16 762.60**	**8 660.24**	**3 418.297**	**1 103**	**13 387.637**	**86.0%**	**4 267**	**1 088 088**	**192 216**	**1 280 301**	**81 278**	**46 162**	**72 680**

1) Excludes 441 staff from Vista, but includes the adjustment of 55 staff from Rhodes East London campus to Fort Hare, and 24 staff from Stellenbosch dentistry to Western Cape.

2) Excludes 430 staff from Vista, but includes the adjustment of 43 staff from Rhodes East London campus to Fort Hare, and 25 staff from Stellenbosch dentistry to Western Cape.

3) Includes staff data to cater for former Vista pipeline students.

4) The 2004 staff were used for institutions in which former Vista campuses were incorporated.

5) Since institutions that merged from 1 January 2005 were not able to split their research output into pre-merged institutions, the DoE had to split the data themselves, using various proxies and historical trends.

6) Institutions that merged in January 2004 were unable to split their research publications into pre-merger institutions. Therefore these institutions were treated as though they have fully merged.

TABLE 5: FUNDING OF RESEARCH OUTPUT FOR 2007/08

HIGHER EDUCATION INSTITUTION	Inst code	NORMED RESEARCH OUTPUT FOR 2005			ACTUAL RESEARCH OUTPUT FOR 2005			Weighted research output	Delivery propor-tion	Shortfall in output	RESEARCH OUTPUT GRANTS FOR 2007/08			PER CAPITA GRANT		
		Headcount of permanently instr/research staff in 2005 (Table 3.3)	Weighted research units per perma-nent instr/ research staff	Weighted research output according to norm	Research publica-tions	GRADUATES (Table 2.13) Research Masters	Docto-rates				Actual research output	Research develop-ment	TOTAL	Actual research output	Research develop-ment	Average Total
		(A)	(B)	C=(AxB)				(D)	(E) = (D/C)	(F) = (C - D)	(G)=D* (J)total/(C)total (R'000)	(H) = (J-G)total* (F/Ftotal) (R'000)	(J) = (G+H) (R'000)	(G/D) (Rand)	(H/D) (Rand)	(J/D) (Rand)
Weightings					1.0	1.0	3.0									
CAPE PENINSULA UT	H01	621	0.5	310.50	68.67	46.000	6	132.670	42.7%	178	11 280	6 939	18 219	85 026	39 021	58 678
CAPE TOWN	H02	829	1.25	1 036.25	892.75	512.829	182	1 951.579	188.3%	0	165 935	0	165 935	85 026	0	85 026
CENTRAL UT	H03	203	0.5	101.50	26.83	9.500	6	54.330	53.5%	47	4 619	1 841	6 460	85 026	39 021	63 646
DURBAN UT	H04	537	0.5	268.50	23.43	36.500	4	71.930	26.8%	197	6 116	7 670	13 786	85 026	39 021	51 345
FORT HARE	H05	230	1.25	287.50	52.92	36.570	1	92.490	32.2%	195	7 864	7 609	15 473	85 026	39 021	53 821
FREE STATE	H06	620	1.25	775.00	410.98	185.840	65	791.820	102.2%	0	67 325	0	67 325	85 026	0	85 026
JOHANNESBURG	H07	917		886.75 1)	325.99	268.000	88	857.990	96.8%	29	72 951	1 122	74 074	85 026	39 021	83 534
KWAZULU-NATAL	H08	1 448	1.25	1 810.00	948.64	364.309	98	1 606.949	88.8%	203	136 632	7 923	144 556	85 026	39 021	79 865
LIMPOPO	H09	804	1.25	1 005.00	105.79	40.500	15	191.290	19.0%	814	16 265	31 751	48 016	85 026	39 021	47 777
MANGOSUTHU	H25	146	0.5	73.00	3.08	0.000	0	3.080	4.2%	70	262	2 728	2 990	85 026	39 021	40 962
NELSON MANDELA	H10	557		520.75 1)	209.28	128.461	30	427.741	82.1%	93	36 369	3 629	39 998	85 026	39 021	76 809
NORTH WEST	H11	769	1.25	961.25	326.19	292.950	82	865.140	90.0%	96	73 559	3 750	77 310	85 026	39 021	80 426
PRETORIA	H12	1 575	1.25	1 968.75	1 100.78	493.890	192	2 170.670	110.3%	0	184 563	0	184 563	85 026	0	85 026
RHODES	H13	306	1.25	382.50	252.78	114.000	31	459.780	120.2%	0	39 093	0	39 093	85 026	0	85 026
SOUTH AFRICA	H14	1 308		1 518.00 1)	519.85	129.620	92	925.470	61.0%	593	78 689	23 121	101 810	85 026	39 021	67 068
STELLENBOSCH	H15	818	1.25	1 022.50	826.13	472.430	126	1 676.560	164.0%	0	142 551	0	142 551	85 026	0	85 026
TSHWANE UT	H16	880	0.5	440.00	87.51	70.167	12	193.677	44.0%	246	16 468	9 612	26 079	85 026	39 021	59 271
VAAL UT	H18	312	0.5	156.00	17.14	10.000	2	33.140	21.2%	123	2 818	4 794	7 612	85 026	39 021	48 794
VENDA	H17	268	1.25	335.00	26.90	30.000	3	65.900	19.7%	269	5 603	10 500	16 104	85 026	39 021	48 071
WALTER SISULU	H19	531		387.75 1)	31.66	2.060	0	33.720	8.7%	354	2 867	13 814	16 682	85 026	39 021	43 021
WESTERN CAPE	H20	465	1.25	581.25	166.01	163.500	35	434.510	74.8%	147	36 945	5 726	42 671	85 026	39 021	73 412
WITWATERSRAND	H21	952	1.25	1 190.00	760.58	318.283	101	1 381.863	116.1%	0	117 494	0	117 494	85 026	0	85 026
ZULULAND	H22	219	1.25	273.75	44.27	26.000	18	124.270	45.4%	149	10 566	5 833	16 399	85 026	39 021	59 905
ALL INSTITUTIONS		**15 315**		**16 291.50**	**7 228.16**	**3 751.409**	**1 189**	**14 546.569**	**89.3%**	**3 802**	**1 236 836**	**148 364**	**1 385 200**	**85 026**	**39 021**	**75 493**

1) Weightings were calculated as follows: Johannesburg: 571x1,25+346x0,5; Nelson Mandela: 323x1,25+234x0,5; South Africa: 1152x1,25+156x0,5; Walter Sisulu: 163x1,25+368x0,5

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