Higher Education Quality Committee

HEQC CHE

A Good Practice Guide for Quality Management of Research

July 2005

CHE

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A Good Practice Guide for Quality Management of Research for Higher Education Institutions

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FOREWORD

A project focused on quality issues in research management was started by the Higher Education Quality Committee (HEQC) in 2003. This project was intended to draw attention to the importance of the management of research at higher education institutions as a tool to strengthen quality issues in research and research-related activities in the context of preparations for the conduct of institutional audits by the HEQC.

The project also reflected the importance of quality-related capacity development in the work of the HEQC, especially in a context where historical disadvantage continues to impact on the capacities of academic staff to produce research and to train postgraduate students.

The HEQC set up the project in such a way as to involve all directors of research at public higher education institutions, as well as deans and deputy vice-chancellors. The final version of this Good Practice Guide has benefited from their comments and their participation in several workshops.

Financially, this project has been possible thanks to funding provided by the Netherlands through the CENESA/NUFFIC programme of international collaboration.

It is hoped that the guide will be used by all higher education institutions according to their own needs and circumstances and that its use will have a positive impact on the development and improvement of systems for the management of research quality.

Dr Mala Singh
Executive Director
July 2005

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ACRONYMS

DoE	Department of Education
HEI	Higher Education Institution
HEMIS	Higher Education Management Information System
HEQC	Higher Education Quality Committee
NQF	National Qualifications Framework
OECD	Organisation for Economic Cooperation and Development
QMSR	Quality Management Systems for Research
R&D	Research and Development

INTRODUCTION

1.1 THE HEQC'S QUALITY ASSURANCE SYSTEM

In most countries the last five decades have witnessed fundamental changes in the relationships between higher education institutions, society and government. This has forced higher education institutions (HEIs) to redefine themselves in relation to broader societal expectations. A fundamental aspect of this redefinition has been the identification of different areas in relation to which HEIs are accountable to governments and societies.

In the case of South Africa the changes in the relationship between HEIs and society were brought to the fore in the context of the 1990s democratic transition and the concomitant identification by policy makers of various elements that would contribute to the reconstruction and development of a society weakened by racial discrimination, political oppression and social inequality. Thus the most general aim of change in post-apartheid South Africa – the development of a just and democratic society where the majority of the population can share in the wealth of the country and realise individual and collective potential – had to be translated into new missions, strategies and directions in discharging the core functions of HEIs.

This process of translation has been expressed in a host of legislation and policy initiatives which have identified a number of goals broadly clustered under the concept of transformation. The purpose of the process of transforming higher education is the development of a higher education system that will:

- Promote equity of access and a fair chance of success for all who are seeking to realise their potential through higher education, while eradicating all forms of unfair discrimination and advancing redress for past inequalities;

- Meet, through well-planned and co-coordinated teaching, learning and research programmes, national development needs, including the high-skill employment needs of a growing economy operating in a global environment;

- Support a democratic ethos and a culture of human rights through educational programmes and practices conducive to critical discourse and creative thinking, cultural tolerance, and a common commitment to a humane, non-racist and non-sexist order; and

- 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. (Higher Education White Paper 3:1.14)

The implementation of these goals is underpinned by three steering mechanisms: planning, funding and quality assurance, around which the national government has developed a broad range of policies and structures. Quality in the national policy for HE is simultaneously seen as an objective of, and a medium for, the transformation of higher education. As a medium, quality is expressed through a complex set of principles, methodologies and tools crystallised in a quality assurance system whose main responsibility is to reassure individuals, civil society and the government that HE providers openly, actively and systematically check, monitor, and improve the quality of their academic provision through a variety of means.

From its launch in 2001, the Higher Education Quality Committee has been working on implementing a national system of quality assurance based on a multifaceted approach to quality assurance. This approach is premised on the view that facilitating the achievement of improved quality in the provision of higher education is a powerful way of giving effect to the transformation objectives which inform the vision of education in a democratic South Africa: equitable access with success, and enhanced social responsiveness by higher education institutions.

A key premise of the quality assurance system proposed by the HEQC is that quality of provision is higher education institutions' main responsibility. At the same time, the HEQC takes into account the influence that each institution's historical trajectory, missions and aspirations have had on the present state of the South African higher education system, its current capacities and future possibilities.

These considerations have led the HEQC to design a system of quality assurance in which programme accreditation (including national reviews), institutional audits, and quality promotion and capacity development, support and interact with each other as parts of a reasonably integrated system whose objective is to sustain the improvement of the actual quality of provision.

The accreditation function of the HEQC focuses on evaluating the institutions' capacity and preparedness to offer good quality new academic programmes at all undergraduate and postgraduate levels from the point of view of their adherence to a series of minimum standards. National reviews focus, within an accreditation methodology, on assessing the academic provision of selected subjects or programmes at a national level from the point of view of, among other things, their academic governance, teaching and learning practices and the structure of the learning programme, against minimum standards agreed upon by peers and experts.

The focus of the HEQC audit function is quality management: the effectiveness of institutions' internal systems in facilitating continuous and systematic quality development and improvement in higher education and enhancing institutional capacity to plan, act and report on quality-related objectives and achievements (HEQC *Framework for Institutional Audits*, 2004a:5).

Finally, quality promotion and capacity development focus on building and strengthening institutional and systemic knowledge, skills and practices in quality assurance. This is to enable HEIs to benefit from the implementation of a national quality assurance system by developing their own internal quality assurance mechanisms. The addition of a capacity development function to the national quality assurance agency in South Africa stems from the HEQC's recognition of the consequences that a history of discrimination and planned underdevelopment have had for some higher education institutions.

The production of good practice guides and manuals is part of the quality promotion and development focus of the HEQC. These guides are tools to help institutions develop their own internal quality assurance mechanisms. In undertaking this activity, as much as in undertaking the rollout of a national system of quality assurance, the HEQC is fully aware that quality assurance systems may be a necessary condition for achieving quality provision but that they are not a sufficient condition for producing quality teaching and learning, research and community engagement. The production of excellent graduates, cutting edge research and innovative community engagement programmes depends not only on the availability of efficient quality assurance mechanisms but also on the sustained nourishing of a community of students and scholars.

1.2. RESEARCH MANAGEMENT AND QUALITY ASSURANCE

The production of new knowledge and the education of new generations of scientists and academics has been one of the fundamental missions of higher education institutions since universities made their appearance in western medieval Europe in the 10th century. At the beginning of the 21st century and in a globalised world, research plays a crucial role in social, economic, technological and cultural progress.

The production of research has become a far more complex and competitive pursuit than formerly. Basic, experimental and strategic research compete for scarce state and donor funding; disciplines compete for funding; universities compete for PhD students. In this context the management of research at higher education institutions has become a professional task that requires the ability to understand and translate national higher education, as well as science and technology, policies and directives at the institutional level into opportunities for individual researchers and postgraduate students to pursue their interests and achieve their potential. But in order to do this efficiently research managers need to be able to develop

and use management information systems for monitoring, evaluating and planning purposes, in relation to national objectives as well as in following up individual careers.

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 outputs 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.

Finally, in a world linked by complex economic relations, the conduct of research at higher education institutions implies the search for and development of partnerships with government, industry and the broader society, the management of issues of intellectual property, and the support of systems of knowledge dissemination and research uptake.

As with quality management systems in general, research management is an important element in creating the conditions for producing quality research. This, however, does not mean that research management guarantees the quality of research outputs or of postgraduate students. Rather, it provides the policies, structures, processes and mechanisms to assure, develop, support and monitor the actual quality of research and postgraduate education, which in turn is measured and judged by peers through a host of local and international review and evaluation mechanisms.

GOOD PRACTICE GUIDE FOR QUALITY MANAGEMENT OF RESEARCH

This Good Practice Guide has been developed taking into account the HEQC's audit framework and criteria. However, it does not introduce an additional layer of minimum standards against which institutions will be evaluated. This Guide presents a comprehensive inventory of good practice for quality management of research, providing institutions with indicators of quality that may be used for their own purposes.

In the context of the preparation for an institutional audit, this Guide can help institutions to think through various aspects of their system for the management of research and to identify strengths and weaknesses in a self-evaluation process. Outside the audit context the Guide's contents can be used, depending on institutional circumstances, as maps to support the construction of a quality management system for research or as checklists against which to test existing systems.

It is hoped that all higher education institutions will benefit from using this Good Practice Guide in whichever ways they see fit, according to their individual missions and institutional identities.

The management of research consists of the planning, resourcing, implementation and assessment of initiatives, actions and programmes geared towards achieving an institution's research aims. From the point of view of quality, a quality management system for research should be geared to the quality assurance, support, development and monitoring of the institution's full spectrum of research activities.

Appendix A presents the quality management systems for research in relation to the different phases and processes of the institutional audit, and shows the various resources institutions will have available to draw on. These resources include this Good Practice Guide for Quality Management of Research, the Framework for Institutional Audits, the Criteria for Institutional Audits, and the Institutional Audit Manual.

2.1 PURPOSE OF THE GUIDE

This Guide sets outs basic definitions of, and a model for, quality management of research at an institutional level. It has been developed as a resource for higher education institutions, to be used at various stages in the development of internal quality management systems for research. Its purpose is to focus on the policies, structures and data that can facilitate the support, development, enhancement, monitoring and review of the quality of their research and research education activities.

2.2. USING THE GUIDE

There are three main sections to this Guide:

Section 3 sets out basic definitions and conventions relating to quality management of research. These draw on international standards of practice and aim to develop a common understanding of research and research management-related terms as they pertain to higher education. They should be used to interpret the model and its implementation in the later sections.

Section 4 describes the model and the mechanisms of quality management of research at the institutional level, in relation to the research process and to various levels of research performance within institutions. The Guide does not pretend to be fully comprehensive or exhaustive. It is important that users understand that the Guide should be interpreted flexibly and sensitively, with due regard for the institution's mission and the context in which a particular institution operates. The 'reflection questions' and recommendations set out in this section are not prescriptive. In setting up their internal systems for the quality management of research, users are encouraged not to follow these recommendations rigidly but rather to use them as conceptual resources and heuristic tools to assist in identifying and prioritising key quality concerns that arise from the users' own contexts.

Section 5 provides a step-by-step guide to how an institution can assess the effectiveness of its quality management systems for research and report on its successes or failures. This section describes what information should be gathered as evidence to support claims made by an institution and how this information should be reported on.

Since the focus of the Guide is on mechanisms for quality management of research, it does not consider research management in general. For example, the Guide does not include all the functions of an institutional research office or how it is managed. Similarly, it does not include suggestions for the quality assessment of the actual research outputs of an institution.

Different institutions may use the Guide differently, as follows:

(i) Institutions that already have an established and functional quality management system for research can use the Guide to check and validate their system.

(ii) Institutions that do not yet have a quality management system for research in place can use the Guide as a resource that provides guidelines for establishing such a system.

BASIC DEFINITIONS AND CONVENTIONS

This section provides basic definitions and conventions relating to research and research management. These draw on international standards of practice and aim to develop a common understanding of research and research management-related terms as they pertain to higher education. Although none of these definitions are necessarily 'cast in stone', a more standard use and understanding of the key notions in research and research management will undoubtedly assist institutions in using this Guide. These definitions should be used to interpret the model for quality management of research described in Section 4 and to assess the effectiveness of quality management systems for research described in Section 5.

3.1. RESEARCH AND INNOVATION

According to the Oxford Dictionary, the term 'research' has French origins and appeared in the 16th century. It is rooted in the term 'search', invented in the 14th century and defined as 'examine *thoroughly*'. Research meant an 'act of searching *closely and carefully*', or 'intensive searching'. It was first applied to science in 1639 as 'scientific inquiry', but rarely used in that context before the end of the 19th century (Godin, 2001).

The OECD (Organisation for Economic Cooperation and Development) 2002 Manual (*Proposed Standard Practice for Surveys of Measurement of Research and Experimental Development*), known as the Frascati Manual, defines research as follows:

> Research within higher education comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humankind, culture and society, and the use of this stock of knowledge to devise new applications. (OECD, 2002:29)

In countries like South Africa, research often has understanding social change as a specific focus and collective and individual development as a fundamental objective. 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.

The Frascati Manual further distinguishes between the following 'types' or 'modes' of research:

- Basic research
- Strategic research
- Applied research
- Experimental development.[1]

3.1.1 Basic research

Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. The results of basic research are not generally sold but are usually published in scientific journals or circulated to interested colleagues (OECD, 2002:77).

3.1.2 Strategic research

Also known as oriented basic research, strategic research is 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 or expected current or future problems or offer possibilities for solving them (OECD, 2002:78).

3.1.3 Applied research

Applied research is also original investigation in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. The results of applied research are intended primarily to be valid for a single or limited number of products, operations, methods or systems. The knowledge or information derived from applied research is often patented but may also be kept secret (OECD, 2002:78).

3.1.4 Experimental development

Experimental development is systematic work, drawing on existing knowledge gained from research and practical experience, that is directed to producing new materials, products and devices, installing new processes, systems and services, and substantially improving those already produced or installed. This category has little or no meaning for the humanities (OECD, 2002:79)

1 These definitions can be applied equally to the Natural Sciences and Social Sciences and Humanities.

The following examples illustrate general differences between basic and applied research and experimental development in the natural sciences and engineering and in the social sciences:

A. Example from the natural sciences and engineering:

Studying a material's absorption of electromagnetic radiation to obtain information about its electron band structure is **basic research**. Studying this material's absorption of electromagnetic radiation under varying conditions (for instance, temperature, impurities, concentration, etc.) to discover its properties of radiation detection (sensitivity, rapidity, etc.) is **applied research.** Preparing a device using this material to obtain better detectors of radiation than those already existing is **experimental development** (OECD, 2002:79).

B. Example from the social sciences:

Analysing the environmental determinants of learning ability is **basic research**. Analysing the environmental determinants of learning ability for the purpose of evaluating education programmes designed to compensate for environmental handicaps is **applied research.** Developing means of determining which educational programme to use for particular classes of children is **experimental development** (OECD, 2002:80).

The Frascati definitions of basic and applied research are not the only accepted ones. Another influential approach to these distinctions is proposed by Donald Stokes in *Pasteur's Quadrant* (Stokes, 1997). Taking two key issues as his point of departure – the use of research and the basic quest for fundamental understanding – Stokes distinguishes between three categories: pure basic research, use-inspired basic research and pure applied research, as shown in this diagram:

		IS RESEARCH INSPIRED BY CONSIDERATIONS OF USE?	
		No	***Yes***
Is research inspired by a quest for fundamental understanding?	***Yes***	Pure basic research (Bohr)	Use-inspired basic research (Pasteur)
	No		Pure applied research (Edison)

The interesting addition that Stokes has made is to identify and emphasise 'use-inspired basic research' as a separate category of research.

3.1.5 Technological innovations

Technological innovations comprise new products, processes and social interventions and significant technological changes in these. An innovation has been implemented if it has been introduced on the market (product innovation) or used within a production process (process innovation) or used as part of an intervention for social development (social intervention). Innovations therefore involve a series of scientific, technological, organisational, financial and commercial activities which occur in, and are shaped by, social dynamics and contexts. This definition has been adapted from the OECD 1997 Manual, known as the Oslo Manual (OECD, 1997:20).

The Oslo Manual further distinguishes between technological **product** and **process** innovations:

> A technological product innovation is the implementation/commercialisation of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer. A technological process innovation is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these. (OECD, 1997:24)

The Oslo Manual elaborates on each of these concepts:

A **technologically new product** is a product whose technological characteristics or intended uses differ significantly from those of previously produced products. Such innovations can involve radically new technologies, can be based on combining existing technologies in new uses, or can be derived from the use of new knowledge (OECD, 1997:138).

> **Examples:** The first microprocessors and video cassette recorders were examples of technologically new products using radically new technologies. The first portable cassette player, which combines existing tape and mini-headphone techniques, was a technologically new product that combined existing technologies in a new use. (OECD, 1997:138)

A technologically improved product is an existing product whose performance has been significantly enhanced or upgraded. A simple product may be improved (in terms of better performance or lower cost) through the use of higher-performance components or materials, or a complex product which consists of a number of integrated technical subsystems may be improved by partial changes to one of the subsystems. (OECD, 1997:138)

> **Examples:** The substitution of plastics for metals in kitchen equipment or furniture is an example of the use of higher performance components. The introduction of ABS braking or other subsystem improvements in cars is an example of partial changes to one of a number of integrated technical subsystems. (OECD, 1997:138)

Technological process innovation is the adoption of technologically new or significantly improved production methods, including methods of product delivery. These methods may involve changes in equipment, or production organisation, or a combination of these changes, and may be derived from the use of new knowledge. The methods may be intended to produce or deliver technologically new or improved products, which cannot be produced or delivered using conventional production methods, or essentially to increase the production or delivery efficiency of existing products (OECD, 1997:141).

> **Examples:** The use of cellular phones to reroute drivers throughout the day allows clients greater flexibility in delivery destinations. Telephone banking allows clients to conduct many of their banking transactions from the comfort of their homes. (OECD, 1997:141)

3.2 POSTGRADUATE RESEARCH

Postgraduate research is research conducted for either a research master's or a doctoral degree. A 'research master's' degree is defined as any master's degree where an independent research thesis constitutes at least 50 percent of the credit for the degree.

According to the latest Higher Education Qualifications Framework under discussion (DoE, July 2004), master's and doctoral degrees occupy Levels 9 and 10 respectively of the National Qualifications Framework. **Appendix B** provides the level descriptors for levels 9 and 10. The level descriptors are the outermost layer of qualification specification and are broad qualitative statements against which more specific learning outcomes can be compared and located.

3.3 POSTGRADUATE SUPERVISION

To supervise literally means to 'oversee'. In the case of academic supervision, it means to oversee the successful completion of the postgraduate thesis. There is some consensus in the literature that the supervisory role implies a number of different responsibilities, giving the supervisor a variety of roles:

- To **advise** the student in the management of the postgraduate project (advisor);
- To **guide** the student through the research process (guide);
- To ensure that the required **academic quality** is achieved, so that the student's work will be of a fit standard to be awarded the degree (quality controller);
- To provide the required **emotional and psychological support** when needed (counsellor and mentor); and
- To ensure that all **administrative and logistical requirements** to obtain the qualification are met (administrator).

3.4 MANAGEMENT OF RESEARCH

While it is acknowledged that research should be protected as a creative and individualised pursuit within an institution, it is also important for an institution to ensure that the environment is conducive to this pursuit, i.e. there must be a true 'research culture'.

Management of research includes all those activities and processes geared to creating an enabling environment for research to flourish, in an institution whose culture fosters imaginative, creative, innovative, high quality research. These activities and processes include research policy making, research planning, allocation of research resources (staff, funding, equipment), research support and development initiatives and the monitoring and evaluation of research quality.

3.5 RESEARCH FUNDING

The term 'research funding' covers all sources of funding for all types of research conducted by and within HEIs. It includes all forms of publicly funded research (agencies and government), donor-funded research (international and local donors), and publicly and privately contracted and consultancy types of research conducted by staff of the HEI.

3.6 RESEARCH SUPPORT AND DEVELOPMENT

Research support and development comprises specific activities or initiatives geared towards improving and enhancing research capacity, resources and outputs. This includes training postgraduate students and supervisors as well as supporting young and inexperienced researchers. In addition, research support and development initiatives should be particularly sensitive to overcoming the barriers black and women researchers faced in the past.

3.7 RESEARCH POLICIES AND PLANS

Research policies set out, in clear and precise language, the principles, rules, regulations and procedures that govern all aspects of research activities within the institution, and define the relevant relations with stakeholders and partners. The policies spell out a vision for research in the institution, including the identification of strategic areas and research priorities, and describe the mechanisms that will make it possible for this vision to be realised.

3.8 RESEARCH INFORMATION SYSTEM

A research information system is a computerised information system (electronic database)

that stores up to date and accurate information about the research and innovation activities, resources (research personnel, funding, equipment) and outputs of the HEI. Such a system should provide for easy retrieval of information and the production of appropriate research management reports that can support the planning, monitoring and implementation of the institution's research goals.

3.9 RESEARCH OUTPUTS

The term 'research outputs' is generally understood to mean the 'knowledge outputs' that result from academic or scientific research and which typically include new theories, models, empirical findings and data. These outputs are usually 'codified' in the form of journal articles, books, conference presentations and other forms of scientific or academic communication. The Department of Education in its *Policy and Procedures for Measurement of Research Output of Public Higher Education Institutions* defines research output as follows:

> Research output is defined as textual output where research is understood as original, systematic investigation undertaken in order to gain new knowledge and understanding. Peer evaluation of the research is a fundamental prerequisite of all recognised output and is the mechanism of ensuring and thus enhancing quality. (DoE, 2003)

Appendix C provides a summary of the definitions of recognised research outputs (journals, books and proceedings) as listed in the Department of Education's *Policy and Procedures for Measurement of Research Output of Public Higher Education Institutions* (2003).

Within South African higher education, it has become standard practice to report on research outputs within the DoE's Classification of Educational Subject Matter (CESM) categories. **Appendix D** describes the CESM categories.

The definition of 'research output' can also be broadened to include other forms of knowledge outputs such as patents, artefacts, designs and other creative works.

3.9.1 Patents

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, imported) only by or with the authorisation of the patentee. The protection of inventions is generally limited to 20 years from the filing date of the application for the grant of a patent (UNDP, 2001).

3.9.2 Artefacts, designs, creative works

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.

3.10 RESEARCH ETHICS

Research ethics means the principles and practices that guide the ethical conduct of research. These should embody respect for the rights of others who are directly or indirectly affected by the research. The rights of others include rights of privacy and confidentiality, protection from harm, giving informed consent, access to information pre- and post-research and due acknowledgement. Ethical conduct in research also includes the avoidance of inflicting animal suffering of any kind and protection of the environment.

3.11 RESEARCH UTILISATION AND TECHNOLOGY TRANSFER[2]

The term 'research utilisation' can be understood either in a narrow or broad sense. In the narrow sense, it refers to the economic or commercial usefulness of research, i.e. how science is useful for economic growth or commercial aims. In the broad sense, it refers to any form of use that the results of scientific research are put to. So, in addition to economic or commercial usefulness, we can include social usefulness (use of research for society at large) and political usefulness (science in support of political decision making).

Technology transfer[2] is an important subcategory of the larger category set of knowledge transfer or activities and processes involving the use of knowledge. It can be defined thus:

> Technology transfer is a principal avenue for the movement of research results from the University to private companies so that products can be developed and commercialized based upon this new knowledge. These results may take the form of inventions, discoveries, processes, techniques, devices, and substances, both physical and biological. (Stony Brook University website)

2 The definitions of 'technology transfer' have been included here because of the growing demand placed on higher education institutions to measure research impact. However, from the definitions it is clear that measuring research utilisation and technology transfer is not a simple quantitative task. For further discussion and illustrations of how one can measure and evaluate these see the Carnegie study on Research Utilisation undertaken by CREST (www.sun.ac.za/crest/research/documentation centre).

The following are some other definitions of technology transfer:

> Technology transfer is the process by which research and other new technologies are transferred into useful processes, products, and programs. Another way of saying the same thing is: technology transfer is the process by which a better way of doing something is put into use as quickly as possible. (Hodgkins, 1989)

> Technology transfer is a process by which existing technology is transferred or transformed to fulfil the user's needs. (Krull, 1990)

> ... all the activities leading to the appropriate adoption of a new product or procedure by any group of users. 'New' is used in a special sense as it means any improvement over existing technologies or processes, not necessarily a chronologically recent invention. [original emphasis] Technology transfer is not simply information dissemination; that is, it is not simply sending out information – whatever the form – and then passively awaiting its use. Technology transfer is a more active term. It implies interaction between technology sponsors and users and results in actual innovation. (Schmitt et al., 1985)

MODEL FOR QUALITY MANAGEMENT OF RESEARCH

4.1 RATIONALE

The management of research at the institutional level within higher education institutions has become a highly specialised and professional task. The vast majority of South African higher education institutions employ dedicated quality assurance officers and research (and innovation) directors/managers who preside over research management and administration offices. The CENIS benchmarking study (Mouton & Dowling, 2001) revealed the extent to which a diversity of functions is performed by these offices and the ever-increasing range of responsibilities they take on. Over and above the growing complexity of research management, South African higher education institutions face fundamental challenges to the way they define their role in society. These challenges stem from the following trends within South African higher education, which also directly or indirectly affect the management of research:

- The high-level goals for transforming the science system in the country from the point of view of both the profile of its human resources and the relationship between its outputs and the needs of a democratic society. (This imperative cuts across higher education and science and technology policy.)
- The national policy imperative (as contained in the National Plan on Higher Education) to increase research outputs (including the output of postgraduate students) while maintaining standards of excellence.
- The increasing shift within public sector research in the country towards more strategic and applied research, to the possible detriment of fundamental research.
- The growing demands for the commercialisation of research and the concomitant implications as far as intellectual property considerations are concerned.

Against this very dynamic and fluid context, the aim of this Guide is to help managers and directors of research to develop and implement systems and procedures to ensure, enhance, monitor and review the quality of research at the institutional level and to achieve institutional and national goals for knowledge production and research education.

4.2 GUIDING QUESTIONS

Bearing in mind that the management of research includes all those activities and processes geared towards creating an enabling environment for research to flourish and encouraging a culture that fosters imaginative, creative, innovative, high quality research, the following overarching and open-ended questions should serve as an ongoing guide to institutions for reflecting on the extent to which their systems achieve this:

- What are the unique and distinctive ways in which the institution enriches and adds excellence to the higher education sector and society, nationally, regionally and internationally?
- What does the institution do to produce a vibrant intellectual culture within the institution and in society at large?
- In what ways does the institution act as an incubator of new ideas and cutting edge knowledge and technologies within the national system of innovation?
- What are some of the notable examples in the previous three years of institutional success in promoting and enhancing quality?
- What does the institution do to attract and retain excellent researchers and scholars?
- Is the institutional infrastructure adequate to support and encourage an environment in which research can flourish?

(HEQC *Criteria for Institutional Audits*, 2004b:5)

4.3 MODEL FOR QUALITY MANAGEMENT OF RESEARCH

A 'matrix' model for quality management of research is presented in Figure 1. The columns (the four headings under 'Research Process') represent the phases in the research process, and the three rows represent the levels of research performance within institutions:

- *Columns:* Four 'phases' in the research process are identified:
  - Developing and evaluating research proposals
  - Accessing research resources
  - Conducting and concluding the research
  - Making the research public and adding value (the dissemination and utilisation phase).

- *Rows:* Three levels of research performance within institutions are identified:
  - Individual research: postgraduate research
  - Individual research: non-degree research
  - Group/centre/unit research.

Figure 1: Model for quality management of research at institutional level

	RESEARCH PROCESS			
LEVELS OF RESEARCH PERFORMANCE	***Developing and evaluating research proposals***	***Accessing research resources***	***Conducting and concluding the research***	***Making the research public***
I. Individual research: Postgraduate research	1. Policies and regulations (Table 1.1) 2. Quality management structures (Table 2.1) 3. Research information systems (Table 3.1) 4. Support and development strategies (Table 4.1)			
II. Individual research: Non-degree research (research projects of staff)	1. Policies and regulations (Table 1.2) 2. Quality management structures (Table 2.2) 3. Research Information systems (Table 3.2) 4. Support and development strategies (Table 4.2)			
III. Group research: ***Research teams/ units/ centres/ institutes/ departments***	1. Policies and regulations (Table 1.3) 2. Quality management structures (Table 2.3) 3. Research information systems (Table 3.3) 4. Support and development strategies (Table 4.3)			

The relationship between process and performance is shown in the three rows in the model. These rows list the following core mechanisms for quality management of research:

- *Policies and regulations:* research policies and plans that contain the principles, rules, regulations and procedures that govern all aspects of research activities within the institution, and define relevant relations with stakeholders and partners
- *Quality management structures:* research management structures (committees/ panels/research offices/incubators/technology transfer offices) that serve as mechanisms for quality management of research
- *Research information system:* a computerised information system (electronic database) that stores up to date and accurate information about the research and innovation activities, resources and outputs of the institution
- *Support and development strategies:* specific activities or initiatives geared towards improving and enhancing the research capacity, resources and outputs of the institution.

The above mechanisms have been translated into the following series of tables that expand the information from the rows in the model:

- Recommendations for research policies and regulations are elaborated in Tables 1.1, 1.2, and 1.3.
- Recommendations for research quality management structures are elaborated in Tables 2.1, 2.2, and 2.3.

- Recommendations for a research information system are elaborated in Tables 3.1, 3.2 and 3.3.
- Recommendations for research support and development strategies are elaborated in Tables 4.1, 4.2 and 4.3.

Although the boundaries between levels of research performance in the model (Figure 1) or between phases of the research process (the tables) may not be as easily demarcated in practice as they appear here, this model and the accompanying tables can nevertheless be used by institutions as a heuristic tool for identifying and prioritising key quality concerns related to the management of research as they arise from users' own contexts.

4.3 INTERPRETING THE TABLES

An institution can build its research policy documents (Tables 1.1, 1.2, 1.3) around the level of research performance (e.g. 'Policy for Postgraduate Studies') or around the stage in the research and innovation cycle (e.g. 'Policy for Research Funding' or 'Policy for Research Support and Development') or around a particular aspect within one of these stages (e.g. 'Policy on Research Ethics'). Given the 'messy' way policies develop in real life, it would not be surprising to find that none of these principles works in isolation in real life. The categories are not watertight.

We need to point out, therefore, that the application of the model does not imply that each row needs to be filled by a unique entity. So, for example, an institution could have a research funding policy that cuts across all three levels of research performance in the top row of the table. Similarly, one could find that an institution has a separate policy document for doctoral studies/degrees that covers all four steps of the research process, from the development of doctoral proposals through to considerations of intellectual property rights and dissemination of findings when making the research public.

The tables are prefaced by a list of questions which institutions should use to reflect on their existing systems. These questions give a sense of the broad quality concerns related to policies, structures, information systems, and support and development for research.

The second column in each table lists recommendations that could be followed so as to establish good practice in quality management systems for research. Again it should be pointed out that not all the recommendations in a particular row will necessarily apply to every research project. For example, policies, structures and support mechanisms related to commercialisation of research might only apply to research projects that deal with new or applied technologies.

Finally, non-degree research activities at higher education institutions comprise both publicly funded and privately contracted research. The recommendations in this Guide could apply equally to both forms of research, although both are of course subject to their own quality review processes. It would therefore be expected that institutions would apply these recommendations in different ways depending on whether they focus more on their portfolio of basic research activities or more commercial/applied research.

1. RESEARCH POLICIES AND ASSOCIATED REGULATIONS AND RULES

Questions to ask in relation to research policies and associated regulations:

1. Is there a research policy that clearly outlines the research vision of the institution/faculty/department/unit/centre/group?
2. Are there policies and regulations that apply specifically to postgraduate research?
3. Do the policies and regulations cover all aspects of the research process, including submitting proposals, accessing resources, conducting research and disseminating or commercialising research?
4. Are the policies written with clear rationales, goals, objectives and explicit criteria?
5. Are there policies that relate to the support and development of research, including capacity development of new researchers, with due regard to race and gender considerations?
6. Do the policies encourage collaborative and problem-solving research at the local/regional/national level?
7. Are there any policies or regulations regarding access to funding and if so, are the criteria and mechanisms for accessing it made clear?
8. Are research policies geared towards increasing research participation, productivity and funding?
9. Do the research policies contain strategies and initiatives that address issues of equity, redress and representativeness?
10. Are policy goals and objectives feasible within given time frames?
11. Are research policy goals aligned with national goals?
12. Are research policy goals appropriate to the institution's mission and vision?
13. Are the research policies that exist regularly reviewed and adapted accordingly?
14. Are policies and regulations readily available and accessible to researchers at all levels of the institution?
15. Have sufficient funds been allocated to implement all the policies?

Table 1.1 Policies and regulations: Postgraduate research

RESEARCH PHASES	*RECOMMENDATIONS* *Policies/regulations relating to postgraduate research should specify:*
Developing and evaluating proposals	• The nature of research honours, master's and doctoral studies and the proportion of research required for each degree • Rules for the submission and approval of research proposals • Contents and format of research proposals • The research ethics position of the institution
Accessing resources	• The sources of funding available to research honours, master's and doctoral students • Procedures and criteria for accessing relevant funds • Availability of special funds, e.g. to attend conferences • Technical support (e.g. equipment) available to postgraduate students
Conducting and concluding research	• The appointment of supervisors and co-supervisors and their responsibilities • The appointment of external examiners and their responsibilities • Expectations and responsibilities of postgraduate students • Clear mechanisms for student complaints and appeals • How research progress will be monitored
Making research public	• The research ethics position of the institution • Copyright and intellectual property rules of the institution • Expectations of postgraduate students with respect to research publications

Table 1.2 Policies and regulations: Non-degree research

RESEARCH PHASES	*RECOMMENDATIONS* ***Policies/regulations relating to non-degree research should specify:***
Developing and evaluating proposals	• The research plans/portfolio and research focus areas of the institution and/or the faculty/department • Whether differentiated support exists for different types of research (e.g. basic, strategic and applied) • Rules for the submission and approval of research proposals • The research ethics position of the institution
Accessing resources	• The sources of internal and external funding available for research These could differ for different categories of researchers. • Procedures and criteria for accessing relevant funds • Availability of special funds, e.g. to attend conferences or to invite visiting researchers • Strategies for increasing research funding
Conducting and concluding research	• How research progress will be monitored • Any incentives for new researchers, with due regard to race and gender. These could include additional funding support. • Any incentives for undertaking collaborative research or problem-solving research at the local/regional/national level • Mechanisms for finally reporting on the research
Making research public	• The research ethics position of the institution • Copyright and intellectual property rules of the institution • Rules, incentives and rewards regarding research-related publications, e.g. relative weightings of research outputs, distribution of DoE subsidies • Rules about commercialisation of research. These could include rules about patents, spin-off companies etc.

Table 1.3 Policies and regulations: Research teams/groups/centres/units/departments

RESEARCH PHASES	*RECOMMENDATIONS* *Policies/regulations related to research teams/groups/centres etc. should specify:*
Developing and evaluating proposals	• Criteria for constituting a research team/group/centre etc. • The research plans/portfolio and focus areas of the research team/group/centre etc. • Whether differentiated support exists for different types of research (e.g. basic, strategic and applied) • Rules for the submission and approval of research proposals • Mechanisms for monitoring the relevance of the research for the research team/group/centre etc.
Accessing resources	• The sources of internal and external funding available for the research teams etc. These could differ for different categories of research teams etc. • Procedures and criteria for accessing relevant funds and approaching specific sponsors • Availability of special funds, e.g. to attend conferences or to invite visiting researchers
Conducting and concluding research	• Any incentives for undertaking research as a team etc. These could include additional funding support • Any incentives for the participation of new researchers (with due regard to race and gender) within the teams etc. • How research progress will be monitored within the team and by the institution • Mechanisms for finally reporting on the research
Making research public	• The research ethics position of the institution and/or the research teams etc. • Copyright and intellectual property rules of the institution • Rules, incentives and rewards regarding research-related publications • Rules about commercialisation of research. These could include rules about patents, spin-off companies etc. • Mechanisms for profiling the research activities of the research team/group/centre etc.

2. QUALITY MANAGEMENT STRUCTURES FOR RESEARCH

Questions to ask in relation to quality management structures for research:

1. Are there sufficient and appropriate structures that implement, coordinate and monitor research policies related to all aspects of the research process, including the evaluation and approval of research, assessment and approval of research funding applications, adherence to research ethics codes and the commercialisation of research?
2. Do the structures contribute to creating an enabling environment for research to flourish in the institution?
3. Are there sufficient and appropriate structures that implement and monitor all aspects of postgraduate research, including mechanisms for students to defend their research?
4. Are there structures that approve and monitor the establishment of research teams/groups/centres/units?
5. Are the structures set up at appropriate levels within the institution?
6. Do participants in these structures have sufficient authority, credibility and expertise to carry out these functions?
7. Does the composition of structures conform to principles of equity and redress?
8. Do the structures function with reference to a clear 'code of conduct' that outlines their brief, e.g. procedures for committees?
9. Do the structures implement clear and transparent criteria consistently?
10. Does coordination and monitoring by structures contribute to the achievement of policy objectives and targets?
11. Do structures operate efficiently?

Table 2.1 Quality management structures: Postgraduate research

RESEARCH PHASES	*RECOMMENDATIONS* *Quality management structures related to postgraduate research should include:*
Developing and evaluating proposals	• Structures for evaluation of research proposals. Participants on these structures could include deans, members of the faculty, prospective supervisors and, if need be, additional experts in the research field. • Structures for approval of research proposals. These could include a centralised or decentralised research or higher degree committees through which all research proposals pass. • The application of explicit criteria for evaluation and approval of research. Criteria could include: o Conceptualisation and objectives of the research o Feasibility of the research o Suitability of the methodology and analysis o Scientific integrity of the research
Accessing resources	• Structures for approval of research funding. Structures could include centralised or decentralised research committees through which all research funding applications pass. • Structures for approval of special funds, e.g. to attend conferences • The application of explicit criteria for approval of funding. Criteria could include: o Contribution the research could make to the relevant field o Suitability of budget for the research o Availability of time and ability of applicant to succeed
Conducting and concluding research	• Structures to monitor research progress. These could include the supervisor–student relationship or supervisory panels/committees. • Structures for doctoral students to defend their research. These could include supervisors and faculty members as well as experts in the relevant research field. • Structures for research students to complain and appeal about any aspect of their research supervision if they believe they have been wronged. • Structures for approval of completed research. These could include external examiners.
Making research public	• Structures to assess compliance with research ethics and intellectual property rules of the institution.

Table 2.2 Quality management structures: Non-degree research

RESEARCH PHASES	*RECOMMENDATIONS* ***Quality management structures related to non-degree research should include:***
Developing and evaluating proposals	• Structures for the evaluation of research proposals for internal and external funding. These could include centralised or decentralised research committees. • The application of explicit criteria for evaluation and approval of research. Criteria could include: o Conceptualisation and objectives of the research o Feasibility of the research o Suitability of the methodology and analysis o Scientific integrity of the research
Accessing resources	• Structures for approval of internal research funding. Structures could include centralised or decentralised research committees through which all funding applications pass. • Structures for approval of special funds, e.g. to attend conferences or to invite visiting researchers • The application of explicit criteria for approval of funding. Criteria could include: o Strategic focus of the research o Contribution the research could make to the relevant field or to the faculty's broader research plan o Suitability of budget for the research o Participation of researchers from a targeted category for special support o Inclusion of collaborators or partnerships o Publication record of researcher
Conducting and concluding research	o Structures to monitor research progress. These could include centralised or decentralised research committees. o Structures for submission of completed research. These could include centralised or decentralised research committees.
Making research public	• Structures to assess compliance with research ethics and intellectual property rules of the institution. • Structures to assess viability of commercialising research. These could include technology transfer offices. • Structures to monitor research output • The application of explicit criteria for measuring research output

Table 2.3 Quality management structures: Research teams/groups/centres/units/departments

RESEARCH PHASES	*RECOMMENDATIONS* *Quality management structures related to research teams/groups/ centres etc. should include:*
Developing and evaluating proposals	• Structures to monitor and approve the establishment of research teams etc. • Structures for the evaluation of research proposals for internal and external funding. These could include centralised or decentralised research committees as well as committees set up by the external funders. • The application of explicit criteria for evaluation and approval of research. Criteria could include: o Fit between objectives of the research and the focus of the research team etc. o Feasibility of the research o Suitability of the methodology and analysis o Scientific integrity of the research
Accessing resources	• Structures for approval of internal research funding. Structures could include centralised or decentralised research committees through which all funding applications pass. • Structures for approval of special funds, e.g. to attend conferences or invite visiting researchers • The application of explicit criteria for approval of funding. Criteria could include: o Strategic focus of the research o Contribution the research could make to the relevant field or to broader research plan of the research team/group/centre etc. o Suitability of budget for the research o Participation of researchers from a targeted category for special support o Publication record of participating researchers
Conducting and concluding research	o Structures to monitor and evaluate effectiveness and efficiency of research teams etc. Such evaluation could be cyclic (every 3 or 5 years) and structures could include external experts in the relevant field. o Structures to monitor research progress. These could be internal or external to the research team/group/centre etc. o Structures for submission of completed research. These could be internal or external to the research team/group/centre etc.

Making research public	• Structures to assess compliance with research ethics and intellectual property rules of the institution • Structures to assess viability of commercialising research • Structures to monitor research output. These could be internal or external to the research team/group/ centre etc. • The application of explicit criteria for measuring research output

3. RESEARCH INFORMATION SYSTEMS

Questions to ask in relation to research information systems:

1. Is all data relating to research in the institution captured by a central research information system, including data relating to research capacity, research funding, research outputs?
2. Is all data relating to postgraduate research in the institution captured by a central research information system?
3. Are data types clearly defined and comparable to other data collected within the national research system?
4. Is the system comprehensive in its coverage of research information to support institutional planning as well as external reporting on research performance?
5. Does the system allow for reporting on individual researchers within a range of categories, including race, gender, age and fields of study?
6. Does the system allow for reporting on research activity at different levels within the institution, including faculties, departments and research centres/groups/units?
7. Is the system robust and reliable?
8. Is accurate information readily accessible timeously and at minimal cost?
9. Is the system regularly updated?

Table 3.1 Research information systems: Postgraduate research

RESEARCH PHASES	*RECOMMENDATIONS* *A research information system should capture the following data relating to postgraduate research:*
Developing and evaluating proposals	• List of all approved research honours, master's and doctoral studies with start dates, linked to department, supervisor and demographic information of student
Accessing resources	• Total amount of funding available for postgraduate research • Success rates of funding applications by honours, master's and doctoral students • List of all sources of funding for honours, master's and doctoral research linked to actual allocation of funds per research project, with starting dates of funding • Total amount of funds allocated to honours, master's and doctoral research, disaggregated to internal and external funds • Total amount of special funds allocated to research students, e.g. to attend conferences
Conducting and concluding research	• List of all completed master's and doctoral research, with end dates, linked to student information, department and supervisor
Making research public	• List of all publications by research students, including co-authorships, linked to list of DoE accredited journals • List of all conference presentations by research students, categorised into national and international

Table 3.2 Research information systems: Non-degree research

RESEARCH PHASES	*RECOMMENDATIONS* *A research information system should capture the following data relating to non-degree research:*
Developing and evaluating proposals	• List of approved research proposals with starting dates, linked to department, and demographic information of staff member • List of approved postdoctoral posts with starting dates, linked to department and demographic information of postdoctoral student
Accessing resources	• Total amount of funding available for non-degree and postdoctoral research • Success rates of researchers' funding applications • List of all sources of funding for non-degree research linked to actual allocation of funds per research project, with starting dates of funding • Total amount of funds allocated to non-degree research, disaggregated to internal and external funds • Total amount of special funds allocated to staff, e.g. to attend research conferences or to host invited researchers • Total amount of funds allocated to postdoctoral research
Conducting and concluding research	• List of all completed research, with end dates, linked to staff information and department and linked to research type (e.g. basic, strategic and applied) • List of medals, prizes and awards conferred on staff by research bodies and associations, linked to their departments. This could include NRF ratings of scientists.
Making research public	• List of all publications by staff linked to list of DoE accredited journals • List of all publications co-authored with research students, linked to department • List of all non-SAPSE accredited publications by staff. These could include: o Contract research reports o Technical manuals o Inputs to official policy documents • List of all conference presentations by staff, categorised into national and international. • List of all patents and spin-off companies related to staff and departments

Table 3.3 Research information systems: Research teams/groups/centres/units/departments

RESEARCH PHASES	*RECOMMENDATIONS* *A research information system should capture the following data relating to research teams/groups/centres etc:*
Developing and evaluating proposals	• List of all research teams/groups/centres etc. linked to faculty or department • List of all researchers in the research team/group/ centre etc. linked to demographic information (including qualification and rank) and research focus areas and/or disciplinary field • List of postgraduate students involved in research team/group/ centre etc. linked to demographic information of students • List of approved research proposals with start dates, linked to research team etc., and demographic information of staff members • List of medals, prizes and awards conferred on research teams etc. by research bodies and associations, linked to their departments or faculties.
Accessing resources	• List of all sources of funding for research teams etc., linked to actual allocation of funds per research project, with starting dates of funding • Total amount of funds allocated to research by research teams etc., disaggregated to internal and external funds • Total amount of special funds allocated to research teams etc., e.g. to attend research conferences or host visiting researchers • A record of ongoing links/relationships with strategic partners/ sponsors
Conducting and concluding research	• List of all completed research, with end dates, linked to staff information and research teams etc. and linked to research type (e.g. basic, strategic and applied)
Making research public	• List of all publications by the research teams etc., linked to staff and linked to list of DoE accredited journals • List of all conference presentations by members of research teams etc., categorised into national and international. • List of all publications co-authored with research students, linked to research teams etc. • List of all non-SAPSE accredited publications by research teams etc. (e.g. contract research reports and technical manuals) • Inputs to official policy documents/ List of all patents and spin-off companies related to research teams etc.

4. SUPPORT AND DEVELOPMENT STRATEGIES

Questions to ask in relation to support and development strategies:

1. Are support and development strategies directed at all levels of the research process, including writing research proposals, accessing resources, completing research and making the research public?
2. Do support and development strategies contribute towards creating an enabling environment for research to flourish in the institution?
3. Are support and development strategies targeted at specific groups of researchers, including new researchers and researchers from designated groups?
4. Are there support and development strategies that specifically target postgraduate research?
5. Are there support and development strategies to encourage collaborative and problem-solving research?
6. Are there support and development strategies that specifically target senior researchers and research managers?
7. Is there a range of support strategies, including incentives, training, mentoring or exchange programmes?
8. Are strategies geared towards meeting specific targets, e.g. for research participation and productivity?
9. Is there adequate infrastructural support to foster and encourage a vigorous research environment?

Table 4.1 Support and development: Postgraduate research

RESEARCH PHASES	*RECOMMENDATIONS* ***Support and development strategies relating to postgraduate research should include:***
Developing and evaluating proposals	• Training and development opportunities for supervisors • Regular discussion meetings between students and supervisors • Availability of research design and methods courses to students • An orientation and induction programme for all research students
Accessing resources	• Scholarships/grants/bursaries for full-time and part-time study • Special funds to support field work and library searches • Fee reductions or bursaries for staff engaged in research studies • Special funds available for conference presentations • Special funds available to support publishing in accredited journals
Conducting and concluding research	• Training and development opportunities for supervisors • Regular discussion meetings between students and supervisors • Regular discussion forums with other researchers (doctoral students or staff) working in related research fields • Access to special support services in the institution, e.g. IT support or editing facilities • Access to visiting researchers, experts in their fields • Rewards/credits to supervisors upon their research students' graduation
Making research public	• Faculty or departmental seminars at which research is presented • Collaborative publications with supervisor

Table 4.2 Support and development: Non-degree research

RESEARCH PHASES	*RECOMMENDATIONS* ***Support and development strategies relating to non-degree research should include:***
Developing and evaluating proposals	• Incentives for senior researchers to act as mentors to new researchers, women and previously disadvantaged groups • Training and development opportunities for mentors • Establishment of collegial groups to support development of proposals
Accessing resources	• Special funds earmarked for various categories of researchers. These could include: o Established researchers o Young researchers o Staff engaged in postgraduate studies o Women and previously disadvantaged groups • Research scholarships abroad for new researchers based on academic and research excellence • Special funds available for employing research assistants • Special funds available for conference presentations, locally and internationally • Special funds available to support publishing in accredited journals
Conducting and concluding research	• Regular departmental seminars in which research projects/interests/ ideas are discussed • Staff development/mentorship programmes for new researchers and researchers in specially targeted groups. The latter could include women and previously disadvantaged researchers. • Training and development opportunities for mentors
Making research public	• Faculty or departmental seminars at which research is presented • Rewards, based on clear criteria, for outstanding scholarly work over a period of time • Rewards and incentives for increasing quality research outputs • A system of weighting research outputs in order to encourage the production of subsidy-related publications • Incentives to commercialise research, where appropriate

Table 4.3 Support and development: Research teams/groups/centres/units/departments

RESEARCH PHASES	*RECOMMENDATIONS* ***Support and development strategies relating to research teams/groups/centres etc. should include:***
Developing and evaluating proposals	• Establishment of collegial groups to support development of proposals • Research portfolio management support of the research team etc. • Incentives to include postgraduate students as well as researchers from designated groups as part of the teams etc.
Accessing resources	• Special funds earmarked for research teams etc. • Special funds available to bring visiting academics and researchers to campus to work with the teams etc. • Special funds available for conference presentations, locally and internationally • Facilitating access to funds from targeted donors/sponsors
Conducting and concluding research	• Financial management support for sustaining the research teams etc. • Rewards for including researchers from specially targeted groups in research teams etc. • Human Resources support for employing contract or temporary research staff as part of research teams etc.
Making research public	• Faculty or departmental seminars at which research is presented • Rewards and incentives for increasing quality research outputs • Incentives to commercialise research, where appropriate • Activities/resources to profile activities and outputs of research teams etc.

ASSESSING AND REPORTING ON THE EFFECTIVENESS OF QUALITY MANAGEMENT SYSTEMS FOR RESEARCH

This section provides guidelines for how an institution can assess the effectiveness of their management systems for research and report to what extent the research activities and processes in the institution are managed, supported and developed in a way that assures and enhances quality, and increases research participation, research productivity and research resources. It describes what information should be gathered as evidence to support claims related to research support and development, research participation, research productivity and research resources, and how this information should be reported on.

The following questions, posed from an institutional perspective, have been used to structure this section:

* What evidence, related to input, process and output factors,[3] can we use to show that all aspects of our research management system have worked or are working effectively?
* What information do we need to gather to provide this evidence?
* How should we report on this evidence?

This section elaborates on some of the guidelines provided to institutions in the Institutional Audit Manuals produced by the HEQC. There are two Audit Criteria[4] which apply to quality-related arrangements for research and one Criterion[5] that applies to quality-related arrangements for postgraduate education. Looking more closely at these criteria and the expectations related to them, this section lists the measurable expected outcomes of an effective system and discusses each in terms of how it can be assessed, the evidence required for making this assessment and the format of reporting. As far as possible, the suggested tables in this section have been aligned to match data categories required by HEMIS and the R&D survey.

Once again, the tables presented here are not meant to be prescriptive. Before looking at these tables, institutions should first ask themselves: what would we use as measures of quality and how can we best report on research support and development, research participation, research productivity and research resources, in our institution? Only after this should institutions consider whether the tables presented here are useful for their purposes or whether they need to adapt them to suit their needs or create their own reporting tables.

3 Input factors include, for example costs (expenditure) and human resources (current enrolments); process factors include quality management and support and development strategies; and output factors include graduations and publications.
4 Criterion 15 and 16; Criterion 15 applies to all institutions and Criterion 16 only to research-intensive institutions.
5 Criterion 17

5.1 RESEARCH POLICIES AND/OR PLANS ARE ADEQUATELY RESOURCED

Research resources at an institution include both the financial and the human resources available for research. What needs to be demonstrated here is how resources for research are allocated and distributed across the institution. Resource allocation and distribution is often a good reflection of the extent to which research is prioritised in an institution and the feasibility of effective implementation of research policies and/or plans.

5.1.1 Financial resources

There are various levels of financial resource allocation within an institution that should be assessed. The first level relates to the proportion of the total expenditure of an institution that is spent on research. The second level relates to the overall expenditure and distribution of the research budget within the institution. This includes the proportion spent on running the Research Office, and, if possible, the research expenditure for faculties/schools/programmes or scientific domains. The third level relates to expenditure on certain 'line items' that contribute to research support in the institution. This includes direct support for student and staff research-related activities and allocations for research capacity development programmes, scientific equipment, library services and IT support.

Since institutions structure their budgets differently, the following tables serve as guidelines only, and should be adapted by institutions to report on their financial resource allocation and expenditure for research.

Table 5.1.1 (a): Total research expenditure in thousand rands

YEAR	*TOTAL EXPENDITURE*[1]	*Research & development expenditure*[1]		*Research office*[2]	*Research and innovation office*[3]
		Total exp.	% of Total exp.	Total exp.	Total exp.
2002					
2003					
2004					

Notes:

1. As reported in the R&D Survey
2. Sometimes called 'Research Administration Office'. This column refers to this office's expenditure only and includes its salaries and running costs.
3. If this office is different to the 'Research Office', then expenditure must be reported separately.

Table 5.1.1 (b): Research support expenditure[1] in thousand rands

EXPENDITURE CATEGORY	*2002*	*2003*	*2004*	*For each category give typical examples of what has been included here*
Scientific equipment				
Library services				
IT support				
Student support for research[2]				e.g. grants, scholarships, bursaries, conference attendance
Staff support for research[2]				e.g. conference attendance, publication page fees
Research capacity				
Development & support programmes[2]				
Other (Specify)				

Notes:

1. This table is NOT a breakdown of the total expenditure, so the total does not have to add up to the previous total. This table is helpful for assessing shifts in expenditure priorities in key areas related to research support.
2. These refer to expenditure derived from internal funds only, i.e. not donor or agency funding.

5.1.2 Human resources

Time devoted to research by academic/research staff is often regarded as the best indicator of the research capacity of the institution. Again there are different levels of research capacity that need to be assessed.

The first level relates to the number of academic staff as a proportion of the total staff at the institution. The second level relates to the profile of academic staff by rank, qualification and current enrolments in postgraduate studies. The latter should ideally be reported per faculty over time.

Since issues of redress and equity should be taken into account in the assessment of human resources, these figures should all be reported by race and gender.

The following tables can be used and adapted by institutions to report on their human resource capacity for research.

Table 5.1.2 (a): Total academic staff[1] (Headcounts)

	TOTAL STAFF									ACADEMIC STAFF									
	A		C		I		W		Total	A		C		I		W		Total	% of total staff
	F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M		
2002																			
2003																			
2004																			

Notes:

1. Referred to as 'permanent research/instruction staff' in HEMIS Table 3.3

Table 5.1.2 (b) Profile of academic staff by rank

	FACULTY 1[1]								
RANK	A		C		I		W		Total
	F	M	F	M	F	M	F	M	
Junior lecturer									
Lecturer									
Senior lecturer									
Professor									
Total									

Notes:

1. This information should be repeated for Faculty 2, Faculty 3 etc.

Table 5.1.2 (c): Profile of academic staff by qualification

	FACULTY 1[1]								
HIGHEST[2]	A		C		I		W		Total
QUALIFICATION	F	M	F	M	F	M	F	M	
Under-graduate degree									
Honours									
Master's									
Doctorate									
Total									

Notes:

1. This information should be repeated for Faculty 2, Faculty 3 etc.
2. Refers to qualification held in year of reporting.
3. In the case of the ex-technikons, honours includes BTech.

Table 5.1.2 (d) Profile of academic staff by current studies

	FACULTY 1[1]								
DEGREE	**A**		**C**		**I**		**W**		**Total**
	F	**M**	**F**	**M**	**F**	**M**	**F**	**M**	
Under-graduate degree									
Honours[3]									
Master's									
Doctorate									
Total									

Notes:

1. This information should be repeated for Faculty 2, Faculty 3 etc.
2. In the case of the ex-technikons, honours includes BTech.

5.2 RESEARCH POLICIES AND/OR PLANS ARE CONSISTENTLY IMPLEMENTED AND MONITORED

One of the best ways to assess the implementation of research policies and plans is to look at the outcomes or results of this implementation. Hence, we have to assume that any increase in research participation, output and funding is evidence of the effective implementation of the institution's research policies and/or plans. To demonstrate any increase one obviously has to report on data over time.

5.2.1 Research participation

Here, the levels of research capacity described under 5.1.2 need to be reported over time. Tables 5.1.2 (a–c) above can be used, if reporting over time, to show whether there have been increases in the proportions of academic staff, and whether the profiles of the academic staff have changed with respect to rank and qualifications. Tables 5.2.1 (a) and 5.2.1 (b) below can be used to show whether there have been increases in the number of postgraduate student enrolments per faculty compared to undergraduates. All these tables will also show whether there have been increases in the number of women and black research staff and postgraduate students participating in research over the previous three years.

Three additional levels of research participation can be assessed. The first relates to the proportion of staff applying for NRF ratings and how many succeed in getting a rating, the second to the proportion of staff applying for funding and their success rates, and the third to numbers of postdoctoral fellows and visiting researchers.

The following tables can be used and adapted by institutions to show increases in the number of postgraduate students per faculty, success rates for NRF ratings, success rates for funding, and participation of postdoctoral fellows and visiting researchers.

Table 5.2.1 (a) Total postgraduate and undergraduate student enrolments by faculty, race and gender over time

	FACULTY 1[1] (2002)									*FACULTY 1 (2003)*								
	A		*C*		*I*		*W*		*Total*	*A*		*C*		*I*		*W*		*Total*
	F	*M*	*F*	*M*	*F*	*M*	*F*	*M*		*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	
Under-graduate students																		
Post-graduate students[2]																		
Total																		
PG/T																		

Notes:

1. This information should be repeated for Faculty 2, Faculty 3 etc.
2. This includes honours, master's and PhD students; at the ex-technikons, this also includes BTech students.

Table 5.2.1 (b) Postgraduate student enrolments by level, faculty, race and gender over time

	FACULTY 1[1] (2002)									*FACULTY 1 (2003)*								
	A		*C*		*I*		*W*		*Total*	*A*		*C*		*I*		*W*		*Total*
	F	*M*	*F*	*M*	*F*	*M*	*F*	*M*		*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	
Honours[2]																		
Master's																		
PhD																		
Total																		

Notes:

1. This information should be repeated for Faculty 2, Faculty 3 etc.
2. In the case of the ex-technikons, honours includes BTech.

Table 5.2.1 (c) NRF Ratings – per faculty by gender and race

	FACULTY 1[1] (2002)									FACULTY 1 (2003)									FACULTY 1 (2004)								
	A		C		I		W		Total	A		C		I		W		Total	A		C		I		W		Total
	F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M	
A-Rated																											
B-Rated																											
C-Rated																											
P-Rated																											
Y-Rated																											
L-Rated																											
Total rated (TR)																											
Number of applications (AP)																											
TR/AP																											

Notes:

1. This information should be repeated for Faculty 2, Faculty 3 etc.

Table 5.2.1 (d) Success rates for funding applications for staff and students[1]

INTERNAL FUNDS

	Applications									Awards[2]									Success rate (Tot app/Tot aw)
	A		C		I		W		Total app	A		C		I		W		Total aw	
	F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M		
Staff																			
Post-graduate research students[3]																			

EXTERNAL FUNDS: NATIONAL RESEARCH AGENCIES

	Applications									Awards[2]									Success Rate (Tot app/Tot aw)
	A		C		I		W		Total app	A		C		I		W		Total aw	
	F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M		
Staff																			
Post-graduate research students[3]																			

Notes:

1. Information should be submitted for the previous three years.

2. Refers to awards granted on submission of research proposals.
3. This includes honours, master's and PhD students who apply for research funding; at the ex-technikons, this also includes BTech students.

Table 5.2.1 (e) Postdoctoral fellows and visiting researchers

	FACULTY 1[1] (2002)										FACULTY 1 (2003)									
	Country of origin	A		C		I		W		Total	Country of origin	A		C		I		W		Total
		F	M	F	M	F	M	F	M			F	M	F	M	F	M	F	M	
Postdoctoral fellows[2]	1.										1.									
	2.										2.									
	3. etc.										3. etc.									
Visiting researchers[3]	1.										1.									
	2.										2.									
	3. etc.										3. etc.									

Notes:

1. Information should be submitted for the previous three years and repeated for Faculty 2, Faculty 3 etc.
2. This refers to researchers appointed as postdoctoral fellows within a faculty, whether South African or non-South African.
3. This refers to researchers hosted by the faculty for extended periods, from two weeks or more.

5.2.2 Research outputs[6]

The primary measures of research outputs in higher education institutions are research publications, patents and non-textual outputs (artefacts, performances, designs) and graduations of postgraduate students.

5.2.2.1 Publications, reports, patents and non-textual outputs

There are various categories of publications that can be reported on. These include articles in SAPSE accredited journals, books/monographs, chapters in books, published conference proceedings and contract research reports. To get a sense of productivity across the institution, publication, patent and non-textual output data should be reported per faculty/school and per gender and race of authors. Again, to measure any increase, this data should be reported over time. The following table can be used and adapted by institutions to report on their publication, patent and non-textual output data for the previous three years.

6 See Appendix C for definitions of recognised research outputs by the Ministry of Education.

Table 5.2.2.1 Publications, reports, patents and non-textual outputs – per faculty by race and gender

	FACULTY 1[1] (2002)									FACULTY 1 (2003)									FACULTY 1 (2004)								
	A		C		I		W		Total	A		C		I		W		Total	A		C		I		W		Total
	F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M	
Books / Monographs																											
Chapters in books																											
Articles in accredited journals[2]																											
Articles in non-accredited journals																											
Published conference proceedings																											
Contract research reports[3]																											
Patents[4]																											
Non-textual outputs (Specify)[4]																											

Notes:

1. This information should be repeated for Faculty 2, Faculty 3 etc.
2. Consult the DoE list of accredited journals.
3. Refers to research reports submitted to a contracting agency and not published elsewhere under the author's name
4. See definitions of patents and non-textual outputs in Chapter 3.

5.2.2.2 Postgraduate graduations

Graduation rates for honours, master's and doctorates should be reported per faculty and per race and gender of students over time. This will show to what extent the postgraduate output has increased per faculty.

The following table can be used and adapted by institutions to report on their postgraduate graduations for the previous three years.

Table 5.2.2.2 Postgraduate graduations – by level and per faculty by race and gender

	FACULTY 1[1] (2002)									FACULTY 1 (2003)									FACULTY 1 (2004)								
	A		C		I		W		Total	A		C		I		W		Total	A		C		I		W		Total
	F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M		F	M	F	M	F	M	F	M	
Honours[2]																											
Master's																											
PhD																											
TOTAL																											

Notes:
1. This information should be repeated for Faculty 2, Faculty 3 etc.
2. In the case of the ex-technikons, honours includes BTech.

5.2.3 Research funding

The research expenditure reported under 5.1.1. will give an indication of trends in research expenditure over time. In addition, an institution should report on its sources of funding for research for the previous three years. These sources should include internal funds, national funding agencies, industry or foreign donors.

The following table can be used and adapted by institutions to report on their external sources of research funding for the previous three years.

Table 5.2.3 Sources of funding in rands

	UNIVERSITY RESEARCH FUNDS[1]	*NATIONAL FUNDING AGENCIES*[2]					*FOREIGN DONORS*[2]	*INDUSTRY*[2]	*OTHER*	*TOTAL*
		NRF	*THRIP*	*MRC*	*ARC*	*WRC*	*Specify*	*Specify*	*Specify*	
2002										
2003										
2004										

Notes:

1. This refers to the amount of the institution's budget committed to research for each year.
2. This refers to the actual amount received for research from these agencies and donors for each year.

5.2.4 Monitoring research policies or plans

It is important for an institution to be able to show that it consistently monitors the implementation of its research policies and plans. Evidence of monitoring research policies would be policy review reports, conducted internally or by an external agent, as well as records of policy decisions made by research committees or senate, based on the reviews of policies.

The following form can be used and adapted by institutions to report on policy monitoring and review processes. Any review documents should also be submitted.

Form 5.2.4 Monitoring and reviewing research policies

POLICY NAME	*IMPLEMENTATION DATE*	*REVIEW DATE*		*COMMENTS ON MAJOR CHANGES BASED ON POLICY REVIEW*
		Internal review – date	*External review – date*	

5.3 STRUCTURES AND MECHANISMS FOR THE QUALITY ASSURANCE OF RESEARCH FUNCTION EFFECTIVELY (FOR RESEARCH-INTENSIVE INSTITUTIONS ONLY)

There are two levels at which the effective functioning of research quality assurance structures and mechanisms can be assessed. The first level is the location of the structure within the institution and its composition. This will show whether the structures and mechanisms are appropriately placed and have the necessary authority and expertise to support the achievement of the research policy objectives and strategic targets. The second level of assessment relates to the actual functioning of these structures or mechanisms. This would include the frequency of meetings, the actual briefs given to these structures and the criteria they use to perform their functions.

To report on the first level, an organogram should be drawn up, showing the location of the research management structures within the institution and who serves on these structures. To report on the second level, the following form can be used and adapted by institutions to report on the functioning of these structures.

Form 5.3 Mechanisms and structures for research quality assurance

STRUCTURE/ MECHANISM	*PARTICIPANTS*	*FREQUENCY OF MEETINGS*	*BRIEF*	*CRITERIA APPLIED*

5.4 STRATEGIES FOR RESEARCH SUPPORT AND DEVELOPMENT, INCLUDING CAPACITY DEVELOPMENT, ARE EFFECTIVELY IMPLEMENTED AND MONITORED

To assess the effectiveness of research support and development strategies, an institution has to report on the budget allocated to these strategies, as well as participation rates, success rates and performance indicators, depending on the nature of the strategy. For example, if the nature of support is financial, an institution should report on the success rates of applications for research funds. If it is a research support and development programme or initiative, an institution should report on the focus of the programme, the number and demographics of participants, and performance indicators that have been used to measure the impact of the programme on individuals.

The following tables can be used and adapted by institutions to report on the budget, success rates, participation rates and performance indicators related to strategies for research support and development.

Table 5.4 (a) Research support and development for staff

ACTIVITIES	DATE	ATTENDANCE								Total	PERFORMANCE INDICATORS
		A		C		I		W			
		F	M	F	M	F	M	F	M		
Conference attendance											
Exchange programmes											
Staff development workshops											
Etc.											

Table 5.4 (b) Research support and development for postgraduate education[7]

ACTIVITIES	DATE	ATTENDANCE								Total	PERFORMANCE INDICATORS
		A		C		I		W			
		F	M	F	M	F	M	F	M		
Conference attendance											
Exchange programmes											
Staff development workshops											
Etc.											

5.5 AN EFFICIENT AND COMPREHENSIVE RESEARCH INFORMATION SYSTEM HAS BEEN EFFECTIVELY USED FOR PLANNING AND EXTERNAL REPORTING

The effectiveness and efficiency of an institution's research information system can be assessed by considering how the system is being used by the institution. This includes reporting on how often information is updated, how often information is retrieved, by whom and for what purpose. For example, an institution should report on when information has been used for internal planning or dissemination purposes and when it has been used for external reporting on the research capacity or performance of the institution. If the information captured in this system is infrequently used by the institution then it has to be assumed that the institution has a research information system that is inefficient and not comprehensive.

7 This refers to research honours, master's and doctoral programmes.

The following form can used and adapted by institutions to report on their research and information system.

Form 5.5 Use of research information system

DATE OF RETRIEVAL	*PURPOSE*	*REQUESTED BY WHOM*

5.6 MECHANISMS AND STRATEGIES FOR THE QUALITY ASSURANCE, SUPPORT AND DEVELOPMENT OF POSTGRADUATE EDUCATION HAVE BEEN EFFECTIVELY IMPLEMENTED AND MONITORED

We assume that the participation rates of postgraduate students will have been reported under 5.2.1, graduation rates under 5.2.2.2, structures and mechanisms for quality assurance and monitoring of postgraduate education under 5.3 and support and development strategies for postgraduate education under 5.4 (b). Reporting on postgraduate education in these categories allows one to assess whether an institution pays adequate attention to postgraduate education as part of its research quality management system.

In addition to the above, there are at least two more aspects related to postgraduate education that should be assessed. The first is the relationship between supervisors and students[8] and the second is the research output by postgraduate students.

5.6.1 Supervisors and students

There are two levels at which this relationship can be assessed. The first is the ratio of supervisors to research students per faculty. This ratio gives a good indication of the potential support that postgraduate students can receive within a faculty. The second is a more qualitative assessment that includes the frequency of meetings between students and supervisors and the nature of these meetings. For example, supervisors and students could meet more frequently at the start of a project, to conceptualise and plan the research, or meetings could become more frequent at the analysis stage of the project or at the writing-up stage of the project. Supervisors could give students written feedback or only verbal feedback. An institution should report on a sample of practices from a variety of faculties.

The following table can used and adapted by institutions to report on the ratio of supervisors to students per faculty.

8 This refers only to research honours, master's and doctoral students.

Table 5.6.1 Ratio of supervisors to research students

	Honours[1] students (H stud)	*Honours supervisors (H sup)*	*Ratio (H stud/ M sup)*	*Master's[1] students (M stud)*	*Master's supervisors (M sup)*	*Ratio (M stud/ M sup)*	*PhD students (P stud)*	*PhD supervisors (P sup)*	*Ratio (P stud/ P sup)*
Faculty 1									
Faculty 2									
Faculty 3									
Etc.									

Notes:

1. This refers only to research honours and master's students.

5.6.2 Postgraduate research output

An institution should report here on the number and nature of publications and conference presentations by postgraduate students. This includes publications that are co-authored with supervisors or other research students and joint conference presentations. Again, this information should be reported per faculty. The following table can used and adapted by institutions to report on postgraduate research output.

Table 5.6.2 Research outputs by postgraduate students

	FACULTY 1		***FACULTY 2***		***FACULTY 3 ETC.***	
	Total	***How many single authored?***	***Total***	***How many single authored?***	***Total***	***How many single authored?***
Articles in accredited journals[1]						
Articles in non-accredited journals[1]						
Published conference proceedings						
Patents[2]						
Non-textual outputs[2]						
Other:						

Notes:

1. Consult the DoE list of accredited journals.
2. See definitions of patents and non-textual outputs in Chapter 3.

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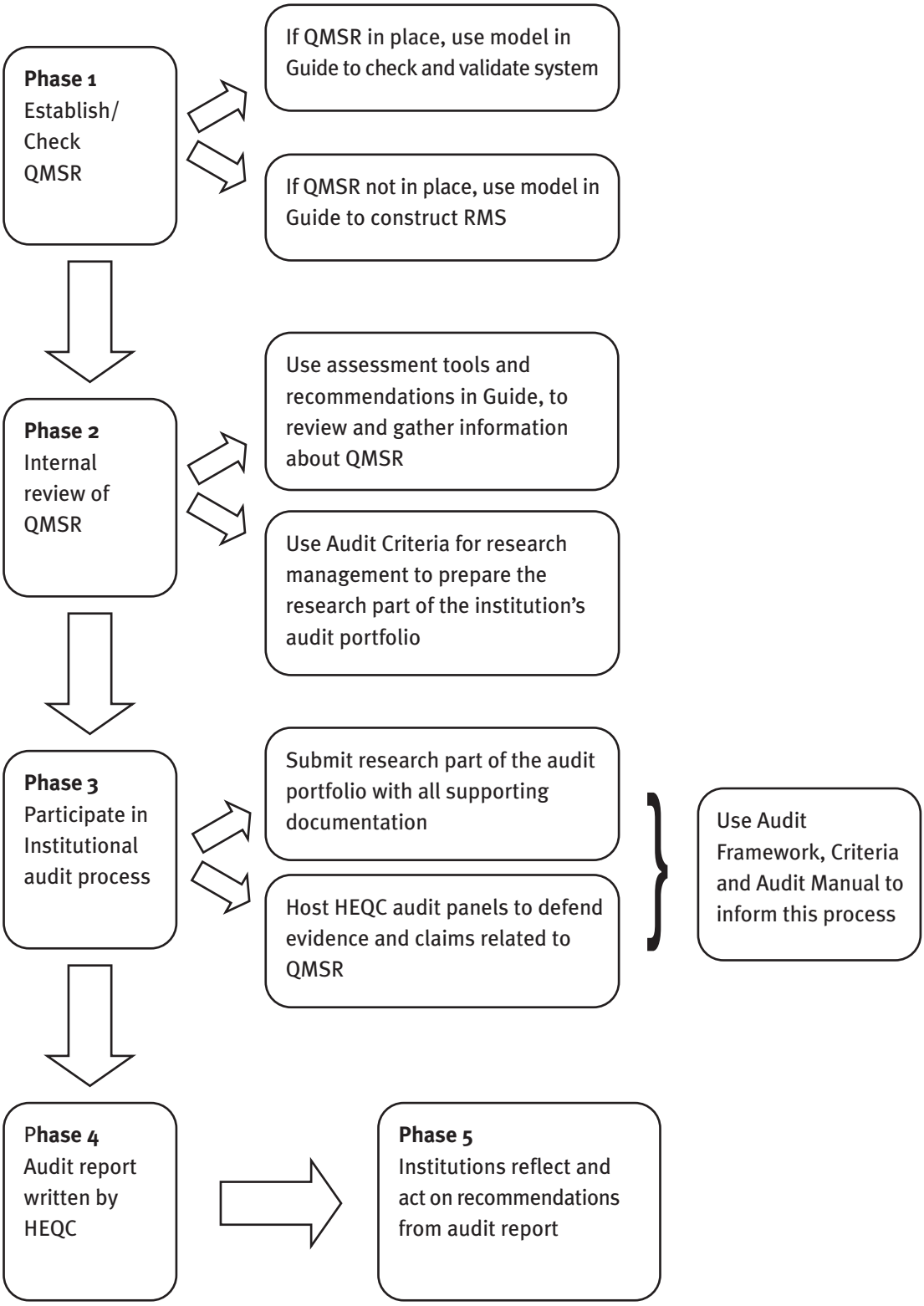
Phase 1
Establish/
Check
QMSR
If QMSR in place, use model in Guide to check and validate system
If QMSR not in place, use model in Guide to construct RMS
Phase 2
Internal
review of
QMSR
Use assessment tools and recommendations in Guide, to review and gather information about QMSR
Use Audit Criteria for research management to prepare the research part of the institution's audit portfolio
Phase 3
Participate in
Institutional
audit process
Submit research part of the audit portfolio with all supporting documentation
Host HEQC audit panels to defend evidence and claims related to QMSR
Use Audit Framework, Criteria and Audit Manual to inform this process
Phase 4
Audit report
written by
HEQC
Phase 5
Institutions reflect and act on recommendations from audit report

NQF level	Applied competence	Autonomy of learning
Typically, a programme leading to the award of a qualification at this level aims to develop learners who demonstrate:		
9	a. a comprehensive and systematic knowledge base in a discipline/field with specialist knowledge in an area at the forefront of the discipline/field or area of professional practice b. a coherent and critical understanding of the theory, research methodologies and techniques relevant to a discipline/field; an ability to rigorously critique and evaluate current research and participate in scholarly debates in an area of specialisation; an ability to relate theory to practice and *vice versa* and to think epistemologically c. mastery of the application of research methods, techniques and technologies appropriate to an area of specialisation; an ability to undertake a research project and write up a research dissertation under supervision d. an ability to identify, analyse and deal with complex and/or real world problems and issues drawing systematically and creatively on the theory, research methods and literature of a discipline/field e. advanced information retrieval and processing skills; identification, critical analysis, synthesis and independent evaluation of quantitative and/or qualitative data; an ability to undertake a study of the literature and current research in an area of specialisation under supervision f. an ability to effectively present and communicate the results of research to specialist and non-specialist audiences using the resources of an academic/professional discourse; the production of a dissertation or research report which meets the standards of scholarly/professional writing	g. a capacity to operate effectively in complex, ill defined contexts h. a capacity to critically self-evaluate and continue to learn independently for continuing professional development i. a capacity to manage learning tasks autonomously professionally and ethically j. a capacity to critically evaluate own and others' work with justification

NQF level	Applied competence	Autonomy of learning
Typically, a programme leading to the award of a qualification at this level aims to develop learners who demonstrate:		
10	a. A comprehensive and systemic grasp of a discipline/field's body of knowledge with expertise and specialist knowledge in an area at the forefront of the discipline, field or professional practice b. a critical understanding of the most advanced research methodologies, techniques and technologies in a discipline/field; an ability to participate in scholarly debates at the cutting edge of an area of specialisation;an ability to apply knowledge, theory and research methods creatively to complex practical, theoretical and epistemological problems c. substantial, independent research and advanced scholarship resulting in the (re) interpretation and expansion of knowledge which is judged publishable by peers d. an ability to identify, conceptualise, design and implement research projects that address complex, ill-defined problems at the cutting edge of a discipline/field e. advanced information retrieval and processing skills; an ability to independently undertake a study and evaluation of the literature and current research in an area of specialisation f. an ability to effectively present and communicate the results of research and opinion to specialist and non-specialist audiences using the full resources of an academic/professional discourse; the production of a thesis which meets international standards of scholarly/professional writing	g. a capacity to operate autonomously in specialised, complex, ill-defined and unpredictable contexts h. intellectual independence and research leadership through managing advanced research and development in a field professionally and ethically i. a capacity to critically evaluate own and others' work on the basis of independent criteria

(Department of Education, *The Higher Education Qualifications Framework*, Draft for discussion, July 2004)

DEFINITIONS OF RECOGNISED RESEARCH OUTPUTS[9]

Journals

Journals refers to peer reviewed periodical publications devoted to disseminating original research and new developments within specific disciplines, subdisciplines or fields of study. These include original articles, research letters, research papers, and review articles.

Books

Books refers to peer reviewed, non-periodical scholarly or research publications disseminating original research on developments within specific disciplines, subdisciplines or fields of study. Examples of different types of books include:

Monographs, which are relatively short books or treatises on a single scholarly subject written by a specialist or specialists in the field and are generally not extensive in scope;

Chapters, which are one or more major divisions in a book, each complete in itself but related in theme to the division preceding or following it;

Edited works, which are collections of scholarly contributions written by different authors and related in theme. A book may have one or more editors.

Proceedings

Proceedings refers to a published record of a conference, congress, symposium or other meeting whose purpose is to disseminate original research and new developments within specific disciplines, subdisciplines or fields of study.

(Department of Education, *Policy and Procedures for Measurement of Research Output of Public Higher Education Institutions*, 2003)

9 See the full policy document for details of the criteria of research outputs for subsidy purposes.

CLASSIFICATION OF EDUCATIONAL SUBJECT MATTER (CESM CATEGORIES)

The following is a list of CESM categories by scientific domain:

Social Sciences and Humanities	*Natural Sciences and Engineering*	*Health Sciences*
• Arts, Visual and Performing • Business, Commerce and Management Sciences • Communication • Education • Home Economics • Industrial Arts, Trades and Technology • Languages, Linguistics and Literature • Law • Libraries and Museums • Military Sciences • Philosophy, Religion and Theology • Physical Education, Health Education and Leisure • Psychology • Public Administration and Social Services • Social Sciences and Social Studies	• Agriculture and Renewable Natural Resources • Architecture and Environmental Design • Computer Science and Data Processing • Engineering and Engineering Technology • Life Sciences and Physical Sciences • Mathematical Sciences	• Health Care and Health Sciences