Department of Science and Technology | Statistics South Africa | Human Sciences Research Council

CeSTII SURVEY OF RESEARCH & EXPERIMENTAL DEVELOPMENT (R&D) INPUTS TO HIGHER EDUCATION: 2004 ACADEMIC YEAR

UNIT	Please modify address label if necessary

AUTHORITY

The Centre for Science, Technology and Innovation Indicators (CeSTII), within the Knowledge Management Programme of the Human Sciences Research Council (HSRC), conducts the Survey of Inputs into Research and Experimental Development (R&D) for the Department of Science and Technology (DST). The Survey is a component of Official Statistics, as defined in the Statistics Act No. 6 of 1999, and all data gathered for this survey is confidential. The HSRC and DST will not disseminate any information identifiable with an organisation without their consent.

PURPOSE AND SCOPE OF SURVEY

The R&D survey collects data on the inputs into R&D activities performed **IN-HOUSE** in South Africa by all organisations (Including Business, Government, Science Councils, Not-for Profit and Higher Education). The data is used for planning and monitoring purposes and for measuring international competitiveness. Previous survey results may be viewed at www.hsrc.ac.za/RnDSurvey. This survey covers the Academic Year 1 January to 31 December 2004.

DUE DATE

Kindly complete and return this form in the enclosed prepaid envelope as soon as possible, but no later than **7 October 2005**.
Return address: **R&D Survey, Private Bag X2, Vlaeberg, 8018**

ASSISTANCE

If you have any problems in completing this form, please do not hesitate to contact the survey managers for assistance:

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Name (With title)		**Tel**	( )
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Signature		**E-mail**	

THE FOLLOWING DEFINITIONS ARE IMPORTANT IN THE COMPLETION OF THE SURVEY QUESTIONNAIRE: WHAT IS R&D?

Definition

This survey follows the approach of the Organisation for Economic Co-operation and Development (OECD), which defines Research and Experimental Development (R&D) as:

- **Research** is creative work and original investigation undertaken on a systematic basis to gain new knowledge, including knowledge of humanity, culture and society.
- **Development** is the application of research findings or other scientific knowledge for the creation of new or significantly improved products, services or processes.

The basic criterion for distinguishing R&D from related activities is the presence in R&D of an appreciable element of novelty and the resolution of scientific and/or technological uncertainty, i.e. when the solution to a problem is not readily apparent to someone familiar with the basic stock of commonly used knowledge and techniques in the area concerned.

For example investigating electrical conduction in crystals is basic research; application of crystallography to the properties of alloys is applied research. New chip designs involve development. Investigating the limiting factors in chip element placement lies at the border between basic and applied research.

R&D Includes – but is not limited to:

Activities of personnel who are obviously engaged in R&D.
In addition, include:

- The provision of professional, technical, administrative or clerical support and/or assistance to personnel directly engaged in R&D
- The management of personnel who are either directly engaged in R&D or are providing professional, technical or clerical support or assistance to those R&D activities of students undertaking postgraduate research courses
- Supervision and monitoring of postgraduate research courses, including students
- Software development where the aim of the project is the systematic resolution of a scientific uncertainty
- Research work in the biological, medical, engineering, physical and social sciences and the humanities
- Social science research, including economic, cultural, educational, psychological and sociological research
- R&D projects performed on contract for other parties
- "Feedback R&D" directed at solving problems occurring beyond the original R&D phase, for example technical problems arising during initial production runs.

R&D Excludes:

The following ROUTINE activities are excluded, except where they are an essential part of in-house R&D activity:

- Preparation for teaching
- Academic development activities
- Scientific and technical information services
- Engineering and technical services
- General purpose or routine data collection
- Standardisation and routine testing
- Feasibility studies (except into R&D projects)
- Specialised routine medical care, for example routine pathology services
- The commercial, legal and administrative aspects of patenting, copyrighting or licensing activities
- Routine computer programming, systems development or software maintenance where there are no technological uncertainties to be resolved.

The Classification of Borderline Institutions

Research institutes (such as specialised healthcare institutions or "attached" research institutions) that are not directly concerned with third level teaching, but whose activities, R&D or otherwise, are all the same closely associated with the Higher Education sector should be carefully considered:

- Entities initiated by a Higher Education Institution (HEI) that are incorporated as a not-for-profit or business entity should be classified as such. The Survey will capture them in those Sector Surveys.
- Staff and R&D expenditure should be reported where it was incurred. Staff members on the payroll of the Higher Education Institution (e.g. department heads) should be reported by the HEI concerned. Staff that appear on the payroll of a "borderline" institution should be reported by the institution concerned and not the HEI. The same applies to equipment and running costs.
- It would be appreciated if we were informed of all such entities to ensure that they are surveyed by the appropriate sectors and to minimise double counting.

Provincial Hospitals

Higher Education Institutions are requested to report on all academic staff from provincial/academic hospitals with joint appointments at the HEI that perform R&D. This includes headcount, FTE's, labour costs, equipment and running costs. It is understood that some of these costs may not be reflected in the HEI's financial statements, but we request that a best estimate be included where necessary.

PART 1: GENERAL INFORMATION

1. **Name of Higher Education Institution**

2. **Name of reporting unit e.g. Faculty**

Note: For the purposes of the survey it would be preferable to provide data at the level of Faculty as opposed to the institutional level. Data provided at the Faculty level allows for a clearer distinction between research fields and socio-economic objectives. We are, however, aware that the extraction of personnel data from HEMIS per Faculty could prove time consuming and therefore leave the allocation of unit of measure (i.e. institution or Faculty) to the discretion of respondents.

3. **Did the reporting unit perform any IN-HOUSE R&D during the 2004 academic year?**

- In-House R&D refers to R&D performed by the reporting unit on its own behalf or on behalf of others.
- Only R&D performed **in South Africa** should be recorded.

(Please tick)

Yes	☐	**Please proceed to Part 2: Question 4**
No	☐	**Please proceed to Part 5: Question 14 on Outsourced R&D**

If your reporting unit does *not* do any In-House and/or Outsourced R&D, tick the box below and return the questionnaire as a NIL response.

☐

PART 2: R&D PERSONNEL AND STUDENTS

R&D PERSONNEL

Report against the categories listed below for all personnel employed directly on R&D or providing direct R&D services for at least 5% of their time. Please include permanent, temporary, contract and part-time staff.

1. Researchers

- Academic staff engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the direct management of the projects concerned.
- Managers and administrators engaged in the planning and management of the scientific and technical aspects of a researcher's work. Their rank is usually equal or superior to that of persons directly employed as researchers and they are often former or part-time researchers.
- Academic staff involved in research and also studying towards a Masters or Doctoral degree should be included as research staff.
- **EXCLUDING** managers and directors concerned primarily with budgets and human resources, rather than project management.
- **EXCLUDING** masters, doctoral students and post-doctoral fellows doing part time work for the institution or receiving a stipend as research assistants.

2. Technicians directly supporting R&D

- Persons doing technical tasks in support of R&D, normally under the direction and supervision of a researcher.

3. Other personnel directly supporting R&D

3.1 Executive and managerial level

- Executives and directors concerned primarily with budgets and human resources in support of research, rather than project management.

3.2 Administrative and support staff

- Skilled and unskilled crafts workers supporting research.
- Secretarial, administrative and clerical personnel working on, or directly associated with, R&D activity.

R&D STUDENTS

- All Post-doctoral fellows in whichever capacity they are appointed by the institution, and Doctoral students.
- Students undertaking a Masters degree with at least a 40% research component.
- Research assistants (Masters and Doctoral students) doing part time work for the institution or receiving a stipend.

4. HEADCOUNT OF R&D PERSONNEL

Provide the <u>average headcount</u> of all R&D personnel in this reporting unit according to the categories below.

(Consult <u>NOTE A</u> on page 7 on how to extract the researcher headcount from HEMIS)
(Consult <u>NOTE B</u> on page 7 on how to calculate the technician and other support staff headcount)

Qualifications and Personnel Categories	African		Coloured		Indian		White		Subtotal		TOTAL
	M	F	M	F	M	F	M	F	M	F	
Researchers (<u>highest qualification</u>)											
Doctorates											
Masters/Hons/Bachelors or equivalent											
Diplomas and other qualifications											
RESEARCHER TOTAL											
Technicians /Technologists (highest qualification)											
Doctorates											
Masters/Hons/Bachelors or equivalent											
Diplomas and other qualifications											
TECHNICIAN TOTAL											
Other personnel directly supporting R&D											
(a) Executive and managerial level (<u>highest qualification</u>)											
Doctorates											
Masters/Hons/Bachelors or equivalent											
Diplomas											
Other											
Total Executive and Managerial											
(b) Administrative and support staff (<u>highest qualification</u>)											
Doctorates											
Masters/Hons/Bachelors or equivalent											
Diplomas											
Other											
Total administrative and support staff											

Carry subtotals over to Q 5

5. FULL-TIME EQUIVALENTS AND R&D PERSONNEL COST

Using the Male and Female total Headcount of all R&D personnel reported in Question 4, provide the Full-Time Equivalents devoted to R&D, and then calculate the total labour costs of R&D using the average annual cost-to-company (including annual wages and salaries and all associated costs or fringe benefits such as bonus payments, contributions to pension and medical aid funds, payroll tax, etc) per category below.

(Consult NOTE A on page 7 on how to calculate FTE for researchers using HEMIS data)
(Consult NOTE B on page 7 on how to calculate FTE for technicians and support staff)

Personnel Categories	Headcounts (From Q 4)			Full-Time Equivalents (FTE's)			Average annual labour cost per personnel category R'000	Calculated labour cost of R&D R'000
	M	F	Total	M	F	Total (A)	(B)	(A x B)
Researchers (Use senior lecturer as the median cost)								
Technicians directly supporting R&D								
Other personnel directly supporting R&D:								
Executive and Managerial level								
Administrative and support staff								
TOTAL COST OF R&D PERSONNEL (Carry over to Q 8c)								

NOTE A: CALCULATION OF RESEARCHER HEADCOUNTS AND FTE'S USING HEMIS DATA

HEMIS data for the 2004 academic year should be used to calculate researcher headcount and FTE's.

- To extract this data from HEMIS use the SFTE final table structure and the Staff Programme Classification (element number/name: 044/staff programme) Classification Code 020 (Research) as the primary filter.
- We suggest that the data be opened in Microsoft Access or Excel.
- Create a table with the following variables present:
  - *Gender* *Element 012*
  - *Race* *Element 013*
  - *Personnel Category* *Element 039*
  - *FTE Value* *Element 043*
  - *Qualification Type* *Element 046*

- Only report on data pertaining to instruction/research professionals (Classification Code: 01).
- Please capture all staff, namely: Permanent/temporary status, part-time/full-time and joint appointments. The number of records present should provide the **headcount**, while the total of the FTE values will provide the FTE value for Research that is required.
- Should you wish to extract this information at Faculty level, extract the data using CESM categories as a filter, and then divide these CESM's according to Faculty.

NOTE B: CALCULATION OF TECHNICIAN AND OTHER SUPPORT STAFF HEADCOUNT AND FTE'S

Unfortunately HEMIS data only reports on technicians and other staff DOING research and not SUPPORTING research. HEMIS data should therefore not be used to calculate headcount and FTE's of technicians and other staff supporting research. This information should rather be obtained from Management Information, Faculty Officers and/or Faculty Deans.

Calculating full-time equivalents:

For the purpose of this survey, a person can work a maximum of 1 FTE in a year. This is why the FTE is not defined by specifying the maximum number of working hours in a month or year.

So a full time employee spending 40% of his/her time on R&D during half of the survey year would contribute 0.4 x 0.5 = 0.2 FTE to the R&D effort, even if his/her average time per week was, for example 60 hours.

A part-time employee working 40% of a full time week throughout the year on R&D would contribute 0.4 FTE to the R&D effort.

Indirect services:

Labour costs of persons providing indirect services such as security and maintenance personnel, staff of central libraries, IT departments or head offices, should be **excluded** here but the relevant contribution included under "Other Current costs" in Question 8D.

6. HEADCOUNT OF POSTGRADUATE STUDENTS

Provide the Headcount of all R&D post-doctoral fellows and postgraduate students (full-time and part-time) in the reporting unit according to the categories below.

Postgraduate student categories	African		Coloured		Indian		White		Subtotal		TOTAL
	M	F	M	F	M	F	M	F	M	F	
Post-doctoral fellows											
Doctoral Students											
Masters Students (only research component of a Masters' degree)											
TOTAL											

Carry subtotals over to Q7

7. PERCENTAGE TIME ON R&D AND POSTGRADUATE STUDENT COSTS

Using the headcounts of all R&D post-doctoral fellows and postgraduate students reported in Q 6; provide an estimate of the percentage time spent on research according to the categories below. Then provide the total value of salaries, stipends and all bursaries (both internal and external) from available records.

(Consult NOTE C below on the calculation of percentage time spent on research)

Postgraduate Student Categories	Headcount sub-total (From Q 6)		% Time spent on research		Total value of salaries, stipends & bursaries R'000
	M	F	M	F	
Post-doctoral fellows					
Doctoral students					
Masters students (see NOTE C)					
TOTAL COST OF R&D POSTGRADUATE STUDENTS (Carry over to Q 8c)					

NOTE C: PERCENTAGE TIME SPENT ON RESEARCH FOR POST-DOCTORAL FELLOWS AND POSTGRADUATE STUDENTS

When calculating the percentage time spent on R&D by post-doctoral fellows and postgraduate students please take into account that some students are studying on a part-time basis.

For instance, a Masters Degree course may require a student to spend 50% of course time on research and development. In this case a Masters student studying full-time would equate to 0.5 Research FTE's, while a part-time student may only equate to 0.25 Research FTE's. We understand that this may be a best reliable estimate.

PART 3: IN-HOUSE R&D EXPENDITURE and SOURCES OF FUNDS

8. IN-HOUSE R&D EXPENDITURE

Compile expenditure on IN-HOUSE R&D during the academic year 2004. Include expenditure funded from all sources: internal and external (contracts and grants) and undertaken by the reporting unit on its own behalf or for other parties.

CAPITAL EXPENDITURE ON R&D (See NOTE D on page10 on how to calculate capital expenditure on R&D)

- The full cost of capital expenses must be reported in the year of purchase (do not depreciate).

Including - but not limited to:

- Expenditure on fixed assets used in the R&D projects of this reporting unit
- Acquisition of software, including license fees, expected to be used for more than one year
- Purchase of databases expected to be used for more than one year
- Major repairs, improvements and modifications on land and buildings.

Excluding:

- Other repairs and maintenance expenses
- Depreciation provisions
- Proceeds from the sale of R&D assets.

		R'000
Vehicles, plant, machinery and equipment	**A**	
Land, buildings and other structures	**B**	

LABOUR COSTS OF R&D

		R'000
Total cost of R&D personnel (carried over from Question 5)		
Total cost of R&D postgraduate students (carried over from Question 7)		
TOTAL	**C**	

OTHER CURRENT EXPENDITURE ON R&D (See NOTE E on page 10 on how to calculate current expenditure on R&D)

Including – but not limited to:

- Materials, fuels and other inputs
- Water, electricity and other consumables including telephone and printing
- Subsistence and travel expenses
- Rent, space charge, leasing and hiring expenses
- Repair and maintenance expenses
- Payments to outside organisations for use of specialised testing facilities
- Payments to outside organisations for analytical work, engineering or other specialised services in support of R&D projects carried out by this reporting unit
- Commission/consultant expenses for research projects carried out by this reporting unit
- Other R&D expenses and indirect costs that do not fall under capital expenditure or labour costs
- The relevant % of labour costs of persons providing indirect services such as the Head Office, HR, Finances, security and maintenance personnel, staff of central libraries, IT departments.

Excluding:

- Contract R&D expenses where the research project is wholly carried out elsewhere by others on behalf of this reporting unit
- Payments for purchases of technical know-how (goodwill)
- Payments for patent searches
- Licence fees
- Depreciation provisions.

		R'000
Other Current Expenditure	**D**	

		R'000
TOTAL IN-HOUSE R&D EXPENDITURE (A + B + C + D) **Carry over to Q 9**	**E**	

THE CALCULATION OF IN-HOUSE R&D EXPENDITURE

NOTE D: CAPITAL EXPENDITURE

- Where a capital item is used solely for R&D, allocate the full cost of the item.
- If the capital item is used for more than one activity, include only an estimate of the portion used for R&D.
- Where such an estimate of the portion used for R&D is not available, apply the percentage time that researchers in the reporting unit spent on R&D to the cost of the item.

NOTE E: CURRENT EXPENDITURE

To obtain the R&D current expenditure, it is advised that respondents apply the percentage time spent on R&D by staff within the reporting unit to the total current expenditure of the reporting unit.

So if a Faculty income and expenditure statement shows that the current expenditure for the year was say R1,700,000 and that staff on average spent 22% of their time devoted to R&D, then the R&D current expenditure may be estimated as 0,22 x R1,700,000 = R374,000.

9. SOURCES OF FUNDS

Provide a breakdown of the total R&D expenditure (as reported in question 8) according to <u>sources of funds, and distinguish between contract and grant funding where applicable</u>.

- Funds received from other intermediary sources that are funded from several sources should be reported under "Other South African sources".
- Funding from **contracts:** Research initiated and deliverables defined by the purchaser of the research (goal-directed).
- Funding from **grants:** Research initiated and deliverables defined by the performer of the research (discretionary).

	R'000												
	Research Contracts				Grants					Total			
National and Provincial Government (Including government research institutes (e.g. Water Research Commission) and THRIP funds from DTI) **EXCLUDE HIGHER EDUCATION VOTE SOURCES**													
Agency Funding (e.g. NRF and Innovation Fund)													
Science Council Funding (e.g. CSIR, HSRC, MRC, ARC, Geosciences, SABS, Mintek, AISA)													
Domestic Business (Including industry funds for THRIP projects)													
Other South African Sources													
All Foreign Sources													
SUB-TOTAL (EXTERNAL SOURCES)									**F**				

<u>NOTE F: THE CALCULATION OF GENERAL UNIVERSITY FUNDS</u>

To calculate General University Funds please subtract the value of all external sources listed in Q9 **(F)** from the total in-house R&D expenditure carried over from Q8 **(E**). General University Funds will consist of a contribution from the Higher Education Vote and the HEI's own funds, including interest.

Total R&D EXPENDITURE (carried over from Q8)	**E**	
SUB TOTAL (EXTERNAL SOURCES) (carried over from Q9)	**F**	
GENERAL UNIVERSITY FUNDS (including the Higher Education Vote) (See **<u>NOTE F</u>** above)	**E-F**	

PART 4: CATEGORIES OF R&D EXPENDITURE

10. PROVINCIAL EXPENDITURE ON R&D

State the location where the reporting unit carried out R&D activities and the percentage of the total R&D expenditure.

- Specify where R&D activities actually take place, rather than where they are managed/financed from.

Eastern Cape	
Free State	
Gauteng	
KwaZulu-Natal	
Limpopo	

Mpumalanga	
Northern Cape	
North-West	
Western Cape	
TOTAL	**100%**

11. IN-HOUSE R&D EXPENDITURE BY TYPE OF R&D.

Specify the percentage of total IN-HOUSE R&D expenditure <u>by type of R&D</u>.

Basic Research

- Work undertaken primarily to extend the boundaries of disciplinary knowledge.
- The analysis of properties, structures and relationships with a view to formulating and testing hypotheses, theories or laws.
- The results of basic research are usually published in peer-reviewed scientific journals.

Percentage		

Applied Research

- Original investigation to acquire new knowledge with a specific application in view.
- Activities that determine the possible uses for the findings of basic research.
- The results of applied research are intended primarily to be valid for a single or limited number of products, operations, methods, or systems.
- Applied research develops ideas into operational form and may be published in peer-reviewed journals or subjected to other forms of intellectual property protection.

Percentage		

Experimental Development

- Systematic work using existing knowledge gained from research and/or practical experience for the purpose of creating new or improved materials, products, processes or services, or improving substantially those already produced or installed.

Percentage		

TOTAL	**1**	**0**	**0**

12. RESEARCH FIELDS (RF)

Classify R&D according to Research Fields (RF) code (see Codes book) with associated % expenditure.

- The RF Codes are based on recognised academic disciplines and emerging areas of study.
- More than one RF code may be provided, together with an associated percentage split.
- The classification of R&D using RF codes is a generally accepted international convention.

RF Codes						Percentage		
RF								
RF								
RF								
RF								
RF								

RF Codes						Percentage	
RF							
RF							
RF							
RF							
RF							

TOTAL	1	0	0

13. SOCIO-ECONOMIC OBJECTIVES (SEO)

Classify R&D according to Socio-Economic Objectives (SEO) code (see Codes book) with associated % expenditure.

- The SEO classification provides an indication of the main beneficiary of your R&D activities.
- More than one SEO code may be provided, together with an associated percentage split.
- The classification of R&D using SEO codes is a generally accepted international convention.

SEO Codes						Percentage		
S								
S								
S								
S								
S								

SEO Codes						Percentage	
S							
S							
S							
S							
S							

TOTAL	1	0	0

PART 5: R&D OUTSOURCED / CONTRACTED OUT

Outsourced R&D refers to:

- Outsourced or extramural expenditures are the amounts a reporting unit paid or committed to pay to another organisation for the performance of R&D during a specific period.
- This includes acquisition of the results of R&D performed by and/or grants given to other organisations for performing R&D.

14. R&D OUTSOURCED OUTSIDE SOUTH AFRICA.
State value of R&D outsourced <u>outside</u> South Africa.

R'000

15. R&D OUTSOURCED INSIDE SOUTH AFRICA.
State value on R&D outsourced <u>inside</u> South Africa.

R'000

END OF SURVEY.

THANK YOU FOR YOUR TIME, PATIENCE AND EFFORT

Department of Science and Technology

Statistics South Africa

Human Sciences Research Council

Department of Science and Technology

Statistics South Africa

Human Sciences Research Council