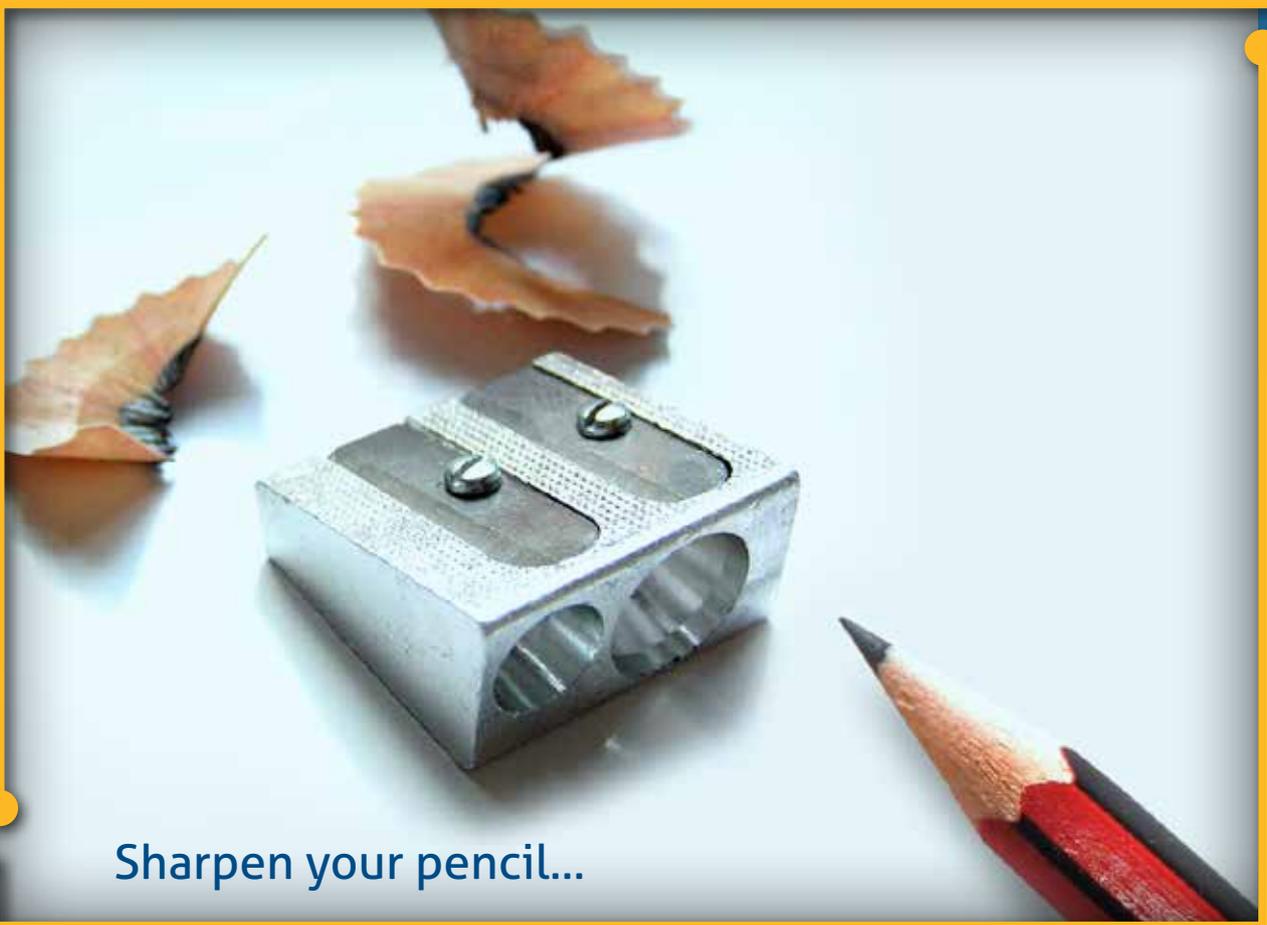




Central University of
Technology, Free State

2014 Manual for Research and Development Support

Research & Development Unit



Sharpen your pencil...

(28 Feb 2014)

Central University of Technology, Free State

28 February 2014

**Manual drafted by the Unit for
Research & Development**

Disclaimer

The provisions of this manual are not to be regarded as an irrevocable contract or source of information between students and the Central University of Technology, Free State (CUT). Please refer to the CUT Calendar/Yearbook, CUT Student Assessment Manual and CUT Intranet for a full account of regulations, policies, procedures and prerogatives for the CUT.

All enquiries can be directed to the Unit for Research & Development

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Introduction

The *White Paper for Post-school Education and Training* and the *National Development Plan* aligns various initiatives to promote human capital development (HCD) in research, innovation and scholarship in South Africa. The document provides a good overview of the challenges facing HCD in research, innovation and scholarship. The statement that HCD requires a multi-faced approach can be supported. One cannot but agree with the comment that “Scientific capability is measured in many different ways, but key components are the number of researchers in the national science system, the annual production of doctoral students and graduates, the number of scientific and technical support staff, and the volume of scientific output, especially of peer reviewed papers published”.

Institutions can identify the challenges related to HCD and should be able to present their actions in support of the identified challenges. The Central University of Technology, Free State (CUT) fully supports the strategy to improve on its postgraduate student throughput and research publications. However, it is evident that there is a need to reconcile three challenges: the development of researchers and postgraduate students, partnerships and collaboration (especially with Science Councils and international partnerships and collaboration), and greater responsiveness to technological innovations and social economic development.

Although implied by the HCD strategy, is it fundamental that universities should reconsider what it is that they are doing research on and what outputs emerge from that research. There is a big difference between being research active (producing publications, graduations), and undertaking purpose-driven research activities (meaning activities where researchers are (i) engaging and reflecting on their disciplines; (ii) extending the scientific basis of their disciplines; and (iii) addressing policy and socio-economic needs which may not always be the direct aim of a research project).

The purpose of this manual is to assist and guide researchers and postgraduate students by means of good practices associated with the research process at the CUT. This manual should provide support to researchers and postgraduate students in doing their research. This manual does not pretend to provide all the answers, but attempts rather to direct researchers to where the supportive material can be found, and to show them how this material can assist them to accomplish their research.



General contact details

Office of the Research and Development Unit

The following Research and Development offices provide services in support of postgraduate studies and research.

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Ms Sandra Nel

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E-mail: snel@cut.ac.za

Research Officer:

Research Administration

Ms Riana Dessels

Tel: +27 51 507 3117

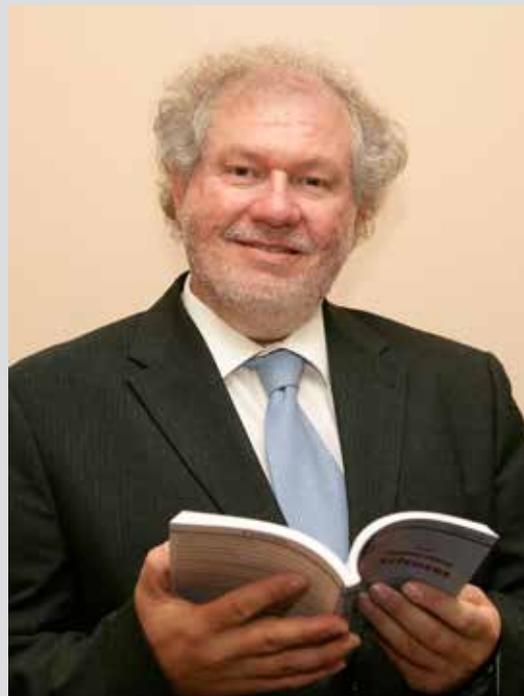
E-mail: rdessels@cut.ac.za

Research Officer: NRF Activities

Ms Zenobia Louw

Tel: +27 51 507 3445

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Prof. Laetus O.K. Lategan



CHAPTER 1

Research and development at the Central University of Technology, Free State

As a university of technology, all research programmes are directed at solving problems in business, industry, and government (this is known as the *triple-helix* approach), and are aimed at contributing to the socio-economic development of the region. The research aims, objectives and values of the CUT are reflected in its *Vision 2020* statement, the *Academic Plan 2014-2020*, the *Research and Development Plan 2014-2020*, and the *Technology & Innovation Plan 2014-2020*.

The focus of research programmes is multi-, inter- and trans-disciplinary of nature, with emphasis on sustainable development, answering especially questions such as *what kind of research is done?*, *what are the objectives?*, and *what impact will the research have?* (JNGS 2012 Volume10 No 3)

At CUT research, research development, technology transfer, innovation and commercialisation activities are understood to be complementary. These activities form part of what is commonly known as the *research cycle*.

The research cycle can be described as the *process of taking the research problem through various academic stages* (such as enrolment for postgraduate qualifications, publication-writing, presentation of conference papers and supervision) *to the process of innovation and patenting* (intellectual property), *commercialisation* (spin-in to business and industry, and first step towards third-stream income) *and eventually production* (spin-out and sustained third-stream income).

Where *research* is normally understood to have a research question/problem for which a solution must be sought, *innovation* can be explained as having the solution to the problem which must now be converted into a possible product/prototype that can be commercialised.

The research cycle thus reflects the integration of research, research development, technology transfer, innovation and commercialisation.

In acknowledging the research cycle and the execution of the research assignment as one of the core activities of the university, the following categories of research participation and productivity have been identified at CUT:

Where RESEARCH is normally understood to have a research question/problem for which a solution must be sought,

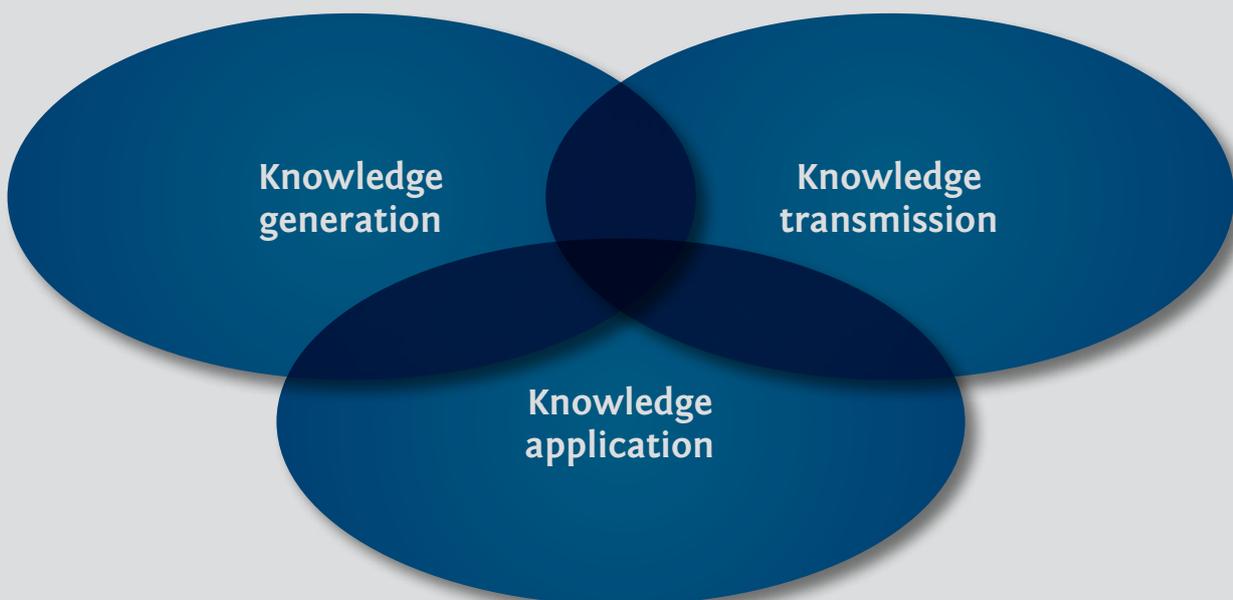
INNOVATION can be explained as having the solution to the problem which must now be converted into a possible product/prototype that can be commercialised.



- Study towards highest qualification in field of study
- Participation in research training
- Writing of publications e.g. books, articles, conference proceedings, etc.
- Conference presentations
- Postgraduate supervision
- Applying for research grants
- Professional research engagement (editorial board, review panels, assessment panels)
- Transfer and innovation (spin-outs)

The CUT regards the development of research, technology transfer and innovation as a continuum. All research activities are regarded as part of the research cycle. Ideally, research participation and productivity should increase as staff members improve their research training and experience; junior lecturers should engage with the improvement of qualifications and participation in research training; and professoriate should engage with all activities associated with research participation and productivity.

The CUT recognises the important role of industry, business, government and social communities in doing research. The university's research objectives are viewed through three core activities: knowledge generation (research), knowledge transmission (teaching) and knowledge application (engagement through technology transfer, innovation and incubation). *What we research* should have an impact on *how we teach* and *engage* with the community. Questions in teaching and learning should open new opportunities to do research on challenges in business, industry, government, the economy and social communities, and should stimulate the research agenda. These three activities are interrelated.



Essentially, research has five core characteristics: problem investigation, critical enquiry, alignment of knowledge patterns, analysis of facts and data, and the discovery of new knowledge. *Research* can therefore be defined as a process of critical analysis to solve scientific and applied (industry-, business- and government-related) problems. This approach embodies the search for new knowledge through scholarly work supported by partnerships and networks.

Although the concepts are not synonymous, research cannot go without *scholarship*. *Scholarship* is the body of principles and practices used by and processes followed by scholars to make their claims about the world as valid and trustworthy as possible, and to make these results known to scholarly and public communities. It furthermore entails the methods that systemically advance the teaching, research, and practice of a given field of study.

Essentially, research has five core characteristics:

- Problem investigation
- Critical enquiry
- Alignment of knowledge patterns
- Analysis of facts and data
- The discovery of new knowledge



CHAPTER 2

Research structures and services in support of postgraduate studies

There are sufficient research structures and services available to support the postgraduate research projects of both students and staff.

2.1 Research support in faculties

2.1.1 Research Managers

Faculty Research Managers (FRMs) manage, administer and oversee research development and postgraduate activity within the faculty. The FRM's key roles can be summarised as:

- a) creating a vibrant research environment and culture,
- b) providing managerial support, and
- c) administering research activities within the faculties.

The FRMs will represent the faculties' targets, plans, internal criteria and procedures.

You are invited to contact your Faculty Research Manager who will advise and direct you in dealing with your research enquiry:

Name of Faculty/Division	Research Manager	Contact details
Faculty of Engineering and Information Technology	Dr Mohamed Mostafa	051-507 3454 mmostafa@cut.ac.za
Faculty of Health & Environmental Sciences	Prof. Ryk Lues	051-507 3145 rlues@cut.ac.za
Faculty of Humanities	Dr Mike Mhlolo	051-507 4027 mmhlolo@cut.ac.za
Faculty of Management Sciences	Prof. Crispin Chipunza	051-507 3218 cchipunza@cut.ac.za
Welkom Campus Technology & Innovation	Mr Molefi Motsoeneng	057-910 3583 smotsoen@cut.ac.za



2.1.2 Faculty Research Committee (FRC)

The Faculty Research Manager is the chairperson of the Faculty Research Committee. Each FRC's functions are custom-specific to the research plan of the faculty. In addition, the following services are provided by FRCs:

- a) Approval of the following applications (in alignment with policy, procedure and faculty targets):
 - National and international conference attendance
 - Sabbatical leave.
- b) Recommendation of student applications for scholarships and grants to the Scholarship and Grants Committee.
- c) Identification and approval of supervisors; and coordination of academic supervision.
- d) Coordination of the following activities:
 - Faculty research workshops
 - Faculty research days
 - Prestige research seminars or colloquiums where postgraduates may present work in progress.
 - Provision of support in the establishment of a Postgraduate Student Association.

2.2 Research and development

The Research and Development Unit (R&D) assists and supports postgraduate researchers across all faculties to increase their research capacity and develop research outputs.

Core activities performed by the Research and Development Unit:

- a) Development and implementation of the *Research and Development Plan, 2014-2020*.
- b) Implementation of research and development policies.
- c) Identification of research categories and profiles.
- d) Implementation and monitoring of research strategies and human skills and development programmes.
- e) General administration of all research activities and research grants.
- f) Annual submission of CUT accredited publications to DHET (for subsidy).

Table 1 illustrates the core capacity-building functions of the Research & Development Unit:



Table: 1 Capacity development model



These capacity development activities can be explained as follows:

2.2.1 Structural development and support

a) The Graduate School

The Research and Development Unit administers a Graduate School. The purpose of this School is to provide collective support to supervisors and postgraduate students in growing their research capacity, and to provide access to *best practice* resources in support of research. A programme on research education and a number of books, as well as electronic resources, have been developed to support academic staff, postgraduate students and postdocs in doing their research (see list of books published by R&D in section 2.2.2, below)

b) Identification of research profiles and implementation of strategic research programmes

The following research profiles and programmes have been identified to grow human skills and potential. These integrated programmes offer opportunities for growth and are directed at final-year undergraduates, postgraduate students and staff, and rated researchers:



Table 2: Research profiles and programmes at the CUT

Ten R&D programmes	Aims & outcomes	R&D support
Undergraduate to Graduate Student's Programme	<p>Grow postgraduate enrolments</p> <p>Successful completion of studies</p> <p>Funding applications for postgraduate studies</p>	<p>Research modules are updated in all curriculum by HODs to bring students on par with the research culture of the university.</p> <p>Supplementary workshops on the research process and writing for funding applications.</p> <p>Funding through NRF/B Tech block grants and NRF grant holder-linked funding.</p>
Master's Education Programme	<p>Successful completion of studies in residential period</p> <p>Application for funding</p>	<p>Workshops focusing on research design, methodology, literature review, scientific writing, and writing for funding application.</p> <p>Support to supervisors.</p> <p>Support to read one conference paper at Faculties' Prestige Research Day and 'five minute presentation' opportunities.</p> <p>Value of grants: to a maximum of R70 000 full time and R40 000 part time including tuition, project and living expenses.</p>
Doctoral Education Programme	<p>Successful completion of studies in residential period</p> <p>Application for funding</p>	<p>Workshops focus on research methodology, statistical analysis, science writing and funding application.</p> <p>Support to supervisors.</p> <p>Support to: read one (1) conference paper at a national conference and one (1) colloquium presentation.</p> <p>Value of grants: to a maximum of R100 000 full time and R60 000 for part time including tuition, project and living expenses.</p>
Next Generation Researcher's Programme: Staff studying toward a doctorate	<p>Successful completion of D degree</p> <p>Application for funding</p>	<p>Support and training of supervisors' research workshops.</p> <p>Waiving of tuition fees for staff.</p> <p>Project cost of to a maximum value of R30 000 per year for residential period of studies.</p>
Emerging Researcher's Programme	<p>Following on completion of a Doctorate and in preparing for a research career, this is for newly appointed staff who obtained a doctorate degree in the two years before joining CUT. Focus is on development of research competencies: supervision basics, publications, presentations and applications for funding.</p>	<p>Competitive grants available to the value of R100 000 per application for a 3-year period to develop research competencies.</p>



Programme	Aims & outcomes	R&D support
Mid-career Researcher's Programme	<p>Delivering outputs that would typically lead at a national level</p> <p>Developing own research programme with participating members and students</p> <p>Obtaining of research competencies and infrastructure in support of active research contribution</p> <p>Grant applications</p>	<p>Mentorship.</p> <p>Project support.</p> <p>Application for rating (NRF).</p> <p>CUT competitive funding available:</p> <p>Competitive grants to the value of R150 000 per application for a 3-year period.</p>
Established Researcher's Programme	<p>Recognition as a leader in his/her field of study</p> <p>Becoming an international expert in research programme through national and international funding, collaboration and joint programmes</p>	<p>Mentorship.</p> <p>Competitive grants available to develop research competencies to the value of R200 000 per application for a 3-year period.</p>
Focus group of CUT: Black Female Researcher's Programme	<p>Enabling black female researchers to complete doctorates and to develop academic career</p>	<p>Mentorship and career development.</p> <p>Research workshops.</p> <p>Project support.</p>
Rated Researcher's Programme	<p>Maintaining NRF rating</p> <p>National and international recognition</p>	<p>CUT competitive funding to the value of R200 000 per application for the duration of a rating period.</p>
Postdoctoral Fellowships		<p>2 tracks as outlined below</p>

Note: The number of grants available is subject to the annual institutional budget

c) Postdoctoral Fellowships

The Postdoctoral Fellowship is a structured programme to develop scholarship and research skills. The university offers two types of postdoctoral fellowship:

Track 1: Full time Postdoctoral Fellowship for a duration of 3 years.

Track 2: Postdoctoral students who have completed their doctoral studies with CUT but who are not CUT staff members (and/or are employed elsewhere) could enter into a Postdoctoral Fellowship for 3 years on a part time basis.



The contents of the Postdoctoral Fellowship Programmes are outlined in Table 4, below:

Table 3: Postdoctoral fellowship programmes at CUT

	Track 1	Track 2
Name:	Postdoctoral Fellowship (full time)	Postdoctoral Fellowship (part time)
Duration	3 years, full time	3 years, part time
Purpose	Scholarship and research skills development	Scholarship and research skills development
Expected outcomes	Publication writing based on research project. Funding application for current research project. Conference attendance for current research project. Supervision. Contribute to research development, planning and, in general, by attending research forums, workshops and presentations at CUT.	Publication writing based on completed doctoral study. Conference attendance based on completed doctoral study. Contribute to research development, planning and, in general, by attending research forums, workshops and presentations at CUT.
Expected outputs	Participate in the official research programme.	Writing-up and publication of research results based on completed doctorate.
Process of application	Call for scholarships. External panel to evaluate applications on a competitive basis.	Call for scholarships. External panel to evaluate applications on a competitive basis.
Funding	Project support: R200 000 per annum for 3 years as stipend.	Project support: R30000 for the duration of postdoc fellowship. No additional allowance.
Status	Staff member	Affiliated with CUT as a non-paying part time staff member/Associate.

d) The University Research and Innovation Committee (URIC)

The URIC fulfils the following functions:

- Position, coordinate, monitor and evaluate research, research development, technology and innovation according to the goals set in the *Academic Plan (2014-2020)*, the *Research & Development Plan (2014-2020)*, *Technology & Innovation Plan (2014-2020)* and *Vision 2020*.
- Develop appropriate research, research development, technology, and innovation policies.
- Position, coordinate, monitor and evaluate a research culture amongst all staff and students.
- Approve student grant applications and awards.
- Implement and promote research ethical and integrity codes and practices.
- Ratify the decisions of sub-committees where applicable and in line with URIC functions and delegations to committees. These may include, for example, proposals, ethical clearance, recommendations, supervisory and examination panels.



The URIC performs its functions through the following sub-committees:

Faculty Research Committees (FRCs), under Faculty Boards

Graduate School Committee (GSC)

Scholarships and Grants Committee (SGC)

Intellectual Property Steering Committee (IPSC)

Innovation and Incubation Fund (IIF)

Research Ethics and Integrity Committee (REIC)

The constitutions and application forms for each of these committees are accessible to staff and registered students on the CUT Intranet. (www.cut.ac.za)

2.2.2 Intellectual skills development

The Research & Development Unit provides opportunities for intellectual capacity building by enabling conference proceedings and study visits, presenting workshops and training events, as well as by publishing two journals (the *INTERIM* and the *JNGS*), providing opportunities either to publish articles or to gain experience on the editorial board.

a) Books published by Research & Development in support of research

A variety of books have been published to develop intellectual capacity. Some of these titles are:

- L.O.K. LATEGAN (Editor). 2008. An Introduction to Postgraduate Supervision. Stellenbosch: African Sun Media. www.africansunmedia.co.za/Sun-e-Shop/Product-Details/tabid/78/ProductId/114/Default.aspx
- U.D. HOLZBAUER, L.O.K. LATEGAN, K. DYASON & D. KOKT. 2012. Seven Imperatives for Success in Research. Bloemfontein: Sun Media. www.africansunmedia.co.za/Sun-e-Shop/tabid/78/ProductId/302/Default.aspx
- L.O.K. Lategan & U.D. HOLZBAUER. 2009 Managing Applied Research: Theories, Cases, and Perspectives. Aachen: Shaker Verlag.
- G.D. JORDAAN, L.O.K. LATEGAN. (Editors). 2010. Modelling as Research Methodology. Bloemfontein: Sun Press. www.africansunmedia.co.za/Sun-e-Shop/tabid/78/ProductId/147/Default.aspx
- L.O.K. LATEGAN, L. LUES, & H. FRIEDRICH-NEL. (Editors). 2011. Doing Research. Bloemfontein: Sun Press. www.africansunmedia.co.za/Sun-e-Shop/tabid/78/ProductId/54/Default.aspx
- L. LUES & L.O.K. LATEGAN. 2006. Re:search ABC. Stellenbosch: Sun Press. www.africansunmedia.co.za/Sun-e-Shop/Product-Details/tabid/78/ProductId/186/Default.aspx

These books are also available at the CUT Library and Information Services on both the Bloemfontein and Welkom Campuses.



b) Support to faculties

Research & Development supports faculties in setting the platform for student and staff participation in research. Typical examples are:

- faculty research seminars
- departmental research colloquiums
- guest lecturers on research ideas/projects
- various student competitions
- external collaboration projects
- student travel and exchange programmes

c) Workshops that are presented by R&D

The following workshops are part of R&D's annual schedule:

Table 4: Focused research workshops throughout the year by R&D

Programme	Contents
General institutional workshop	The research process and explanation of the support, scope and activities of R&D.
Research ethics and integrity workshop	A code of research ethics and integrity for CUT.
Research development aimed at diploma (3 rd year) level	What is Research: characteristics and types of research with emphasis on the understanding of postgraduate studies at CUT, research and the research process.
Research development aimed at B Tech (4 th year) level	With emphasis on understanding postgraduate studies, the research process, and an overview of research design and methodology.
Research development aimed at Master's level	The research process: with emphasis on integrating literature, reviews, work experience and data to formulate constructive conclusions to the research problem, research design and methodology. Research philosophies/paradigms.
Research development aimed at Doctorate level	With emphasis on integrating literature, reviews, work experience and data to formulate constructive conclusions to the research problem; quantitative and qualitative data collection methods, data analysis, research ethics and plagiarism, academic/scientific writing, referencing techniques, bibliographies and assessment.
Publication writing / scientific writing workshop	A training programme in support of scientific writing skills aimed at next generation- and emerging researchers, postgraduate students and postdoctoral fellows. Quantitative and qualitative data collection methods, data analysis, research ethics & plagiarism, academic research writing, referencing techniques, bibliographies and assessment



d) Research publications at the CUT

The Research & Development Unit publishes two research journals: *INTERIM* and the *JOURNAL FOR NEW GENERATION SCIENCES (JNGS)*.

INTERIM: Interdisciplinary Journal

The *INTERIM* is a CUT, in-house interdisciplinary developmental academic journal that gives new researchers the opportunity to publish their research. Twenty editions of the *Interim* were published between 2002 and 2013, constituting close to 220 papers. The *INTERIM* serves as a unique outlet to publish work in progress and aims at developing scientific writing skills in publishing research that meet an acceptable standard of research and writing. It provides an opportunity for academic staff to develop editorial skills in serving on the editorial board.

The *INTERIM* especially affords *next generation* researchers the opportunity to familiarise themselves with the intricacies and challenges of publishing. The purpose is to build confidence in publication writing, to have supportive critique and to gain experience in meeting the requirements for publication. Once a paper has been published in the *Interim*, it can be re-worked and submitted to an accredited journal. The CUT Student Assessment Manual stipulates the requirement for postgraduate students (Master's and Doctorates) to be the submission of a publication (at least) to the *INTERIM*, before graduation.

An *INTERIM* publication is also a minimum requirement when seeking approval for a second national conference attendance that is supported by the research budget.

There is open access to the *INTERIM*, thus ensuring that there is no limitation to the potential readership. (http://www.cut.ac.za/faculty_pages/publication/)

The *INTERIM* is published biannually as:

- a) an institutional edition, managed by R&D
- b) an edition by two faculties, to publish either jointly or individually.

The *INTERIM* Editorial Board consists of

- a) one representative from Research & Development
- b) one representative from the Graduate School
- c) one representative from each faculty.

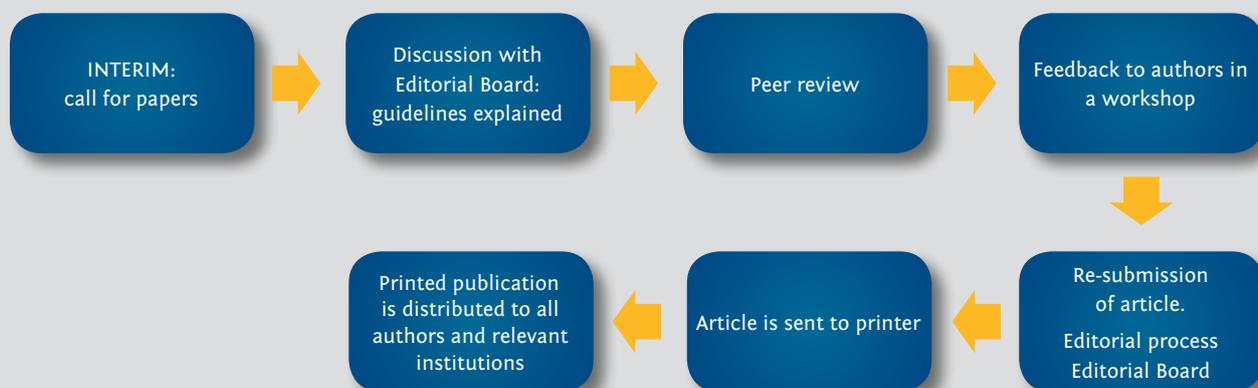
The CUT *Student Assessment Manual* stipulates that Master's and Doctoral students should have a publication submitted to (at least) the *Interim* before graduation.

A publication in the *INTERIM* is also a minimum requirement when seeking approval for a second national conference attendance that is supported by the CUT research budget.



The Research & Development Unit provides administrative assistance to support the publication process. With each call for articles, the editor will stipulate the desired format and means of submission (hard copy and/or e-mail), will provide the guidelines and announce a submission date. Articles are internally peer reviewed and feedback is provided in the form of a workshop.

Steps to publication in the *INTERIM*



Guidelines for the publication of articles in the *INTERIM*

- a) Articles are published in English.
- b) All articles should be accompanied by a 100-word abstract.
- c) All articles should have three to five key words. These should be part of the abstract.
- d) The article should be properly edited, stylistically polished and carefully proofread.
- e) The editor reserves the right to make such alterations as he/she sees fit to accommodate the style and presentation of the article to meet the style of the *Interim*. Where major changes are necessary the text may be returned to the author for correction or approval.
- f) Copyright is transferred to the Central University of Technology, Free State on acceptance for publication.
- g) Titles should be short and concise. Suitable headings and subheadings should be provided. No more than 2 levels of sub headings are desired, for example: 1.1 and 1.1.1
- h) Source references in the text should be in the *Harvard* style, using the author's surname and date.
- i) All *notes* should be regarded as *footnotes*.
- j) Abbreviations and acronyms must be written out in full the first time that they are used.

Keep in mind that your article submitted to a journal (as attachment to your thesis) assists as a "pass" in your final assessment.



- k) Italics should not be over-used for emphasis. Latin phrases such as *per se* must be italicised. Words in languages other than that of the manuscript should be given in quotation marks.
- l) All articles will be peer reviewed.
- m) The author of a published article will receive one copy of the relevant issue of the journal. No *honorarium* will be paid.

Common errors

Authors are directly involved in the review and publication process, which enable them to reflect on common errors made by other authors. These are the common errors:

- a) Titles of papers: many titles are not representative of the contents of the paper and lack alignment of aims and objectives to the title of the paper.
- b) Design: not all papers are well planned with an appropriate methodology and sufficient evidence in support of the research question.
- c) Research question: many papers lack a proper research question or hypothesis.
- d) Methodology: very often the methodology is not supportive of the research, or authors don't know the difference between research method and research methodology.
- e) Literature review: too many authors simply repeat what is already stated in other papers instead of reflecting on and engaging with existing texts.
- f) Literature consulted: the latest texts are not always consulted.
- g) Conclusions: papers often have no new knowledge to add to an existing debate. Papers very often merely recycle what is already known in research.
- h) Referencing: authors do not always follow the appropriate referencing guidelines.
- i) Contents: there is often not a clear understanding that a paper has different parts and that each part has a specific purpose and must not be repeated.
- j) Footnotes: very few authors understand the purpose of footnotes.
- k) Language: papers do not always meet grammar, style and discourse requirements.
- l) Scientific writing: there is not enough argumentation and critical reflection in many papers.
- m) Ethical challenges: very often no evidence that basic ethical requirements are met, such as recognition of funding agency, feedback to sample group, etc.
- n) Relevance of paper: some papers are just add-ons to what is already known.
- o) Technical requirements: papers do not always meet the technical requirements of the *Interim* (for example, the length of the paper, the required referencing technique, the layout of the paper, etc.)



Guidelines to referees of papers for *INTERIM*:

Please provide comments in respect of the following questions:

- a) Does the title reflect the contents of the paper?
- b) Do you deem the paper to be proof of thorough research and knowledge of the most recent debates and literature in this field of study?
- c) Does the paper reflect a high standard of scientific reasoning?
- d) Does the paper contribute to the technological sciences as specific field of study?
- e) Does this paper reflect application to business/industry/the world of work?
- f) What is the desirability of this paper being published in the *Interim*?
 - (i) Without alterations.
 - (ii) With the following alterations:
 - (iii) Preferably not.
 - (iv) Other comment(s):

JOURNAL FOR NEW GENERATION SCIENCES

The *Journal for New Generation Sciences* (JNGS) is a DHET-accredited publication, published biannually by the CUT. Papers in the technological sciences are reviewed and published in its July and December editions. The *JNGS* is an accredited research publication where scholars, internal and external to the institution, may publish. It accommodates national and international publications and showcases the university's commitment to applied research.

The JNGS focuses on papers which reflect the scientific results of:

- a) *Science, Engineering and Technology* (SET), and the management of SET research
- b) applied research informed by industry/business problems
- c) partnerships with industry/business/government (*triple helix*)
- d) knowledge production in the context of Mode 2 knowledge generation
- e) scholarship in teaching and research
- f) research projects leading to SET qualifications
- g) income generation through research
- h) entrepreneurship through innovation



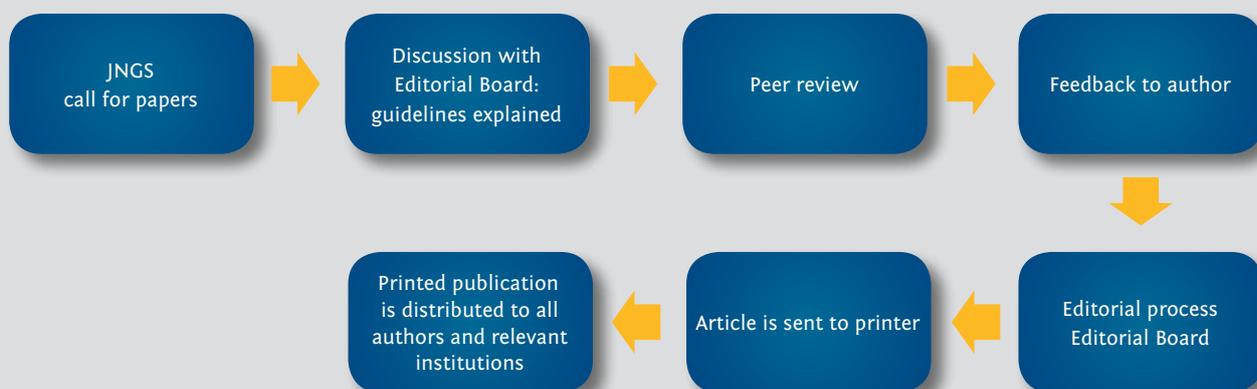
The JNGS follows the Frascati research classification of *basic* and *applied* research. In terms of this, the definitions are as follows:

- (i) Basic research: original investigation with the primary aim of developing more complete knowledge or understanding of the subject under study.
- (ii) Applied research: original investigation undertaken in order to acquire new knowledge and directed primarily toward specific practical aims or objectives.

All papers are peer-reviewed by at least two experts. An editorial review also secures the quality of the paper. The *JNGS* supports both high quality scholarly work of established researchers, and capacity building amongst new researchers.

On a national policy level, the *JNGS* supports the *National Plan on Higher Education, Outcome 13: Research concentration and funding linked to research outputs*.

Steps to publication in the JNGS



Guidelines for the publication of papers in JNGS

- a) Papers are published in English. The preferred length is between 4500-5000 words.
- b) All papers should be accompanied by a 100-word abstract, with three to five key words as part of the abstract of the paper.
- c) Papers should be properly edited, stylistically polished and carefully proofread.
- d) The editor reserves the right to make such alterations as he sees fit to accommodate the style and presentation of the article to the style of the *JNGS*. Where major changes are necessary the text may be returned to the author for correction or approval.
- e) Copyright is transferred to the Central University of Technology, Free State on acceptance for publication.
- f) Titles should be short and concise. Suitable headings and subheadings should be provided. No more than 2 levels of sub headings are desired, for example: 1.1 and 1.1.1



- g) Source references in the text should be in the *Harvard* style, using the author's surname only.
- h) All *notes* should be regarded as *footnotes*.
- i) Abbreviations and acronyms should be written out in full the first time that they are used.
- j) Italics should not be over-used for emphasis. Latin phrases such as *per se* must be italicised. Words in languages other than that of the manuscript should be given in quotation marks.
- k) Refereeing is always anonymous. All articles will be peer reviewed by two referees and the editorial team.
- l) The author of a published paper will receive one copy of the relevant issue of the journal. No *honorarium* will be paid.
- m) Page fees are payable.

Submissions to JNGS on or before the closing date in hard copy and in MS Word on disc or as an MS Word Rtf file via e-mail to:

The Editor: JNGS, Central University of Technology, Free State, Private Bag X 20539, Bloemfontein, 9300. Tel 051 507 3279 or e-mail llategan@cut.ac.za; snel@cut.ac.za

Guidelines to referees of papers submitted to JNGS:

Please provide comments in respect of the following questions:

- a) Does the title reflect the contents of the paper?
- b) Do you deem the paper to be proof of thorough research and knowledge of the most recent debates and literature in this field of study?
- c) Does the paper reflect a high standard of scientific reasoning?
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- e) Does this paper reflect application to business/industry/the world of work?
- f) What is the desirability to this paper being published in the *JNGS*?
 - (i) Without alterations.
 - (ii) With the following alterations:
 - (iii) Preferably not.
 - (iv) Other comment(s):

The JNGS accommodates national and international publications and showcases the university's commitment to applied research.



2.2.3 Policy development

a) Research ethics and integrity

The study of research ethics and the application of research integrity are not new to the scientific community. This is evident from the large number of ethical codes and best practices that exist around the world.

As research is more and more driven by the human rights culture based on the dictum '*do no harm*', economic prospects and business decisions, renewed attention is placed on research ethics to regulate the research process.

Following from literature and policy reviews, debates and applications, it is evident that the challenge is not limited to a conceptual understanding of ethics and integrity only. In a post-modern society the question is: *Whose ethical perspectives should prevail?*

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Another challenge is the concern that, although an enabling ethical climate can be created, there is no guarantee that researchers will behave according to ethical expectations. Hence, the statement remains as to whether one can teach or train researchers to be ethical. Will a researcher's personal value system secure sound ethical behaviour and/or integrity? The answer remains debatable. If one observes what is happening around the world in research laboratories and lecture rooms, then it appears as if ethical/integrity problems are multiplying.

A third challenge is that researchers (especially in the natural sciences) often regard the ethical review as removed from the research process where ethical principles should be recognised and applied during all the stages of the research process.

What are the values of a responsible research community? Although normally not mentioned, this community cannot be without a value-for-money approach (economic responsiveness), quality in research (versus mediocre research outputs) and useful research (in service of society). Research is therefore not an isolated activity. It links up with academic practices, the needs of business/industry/government and the application and implementation of research results. **The following challenges and concerns should be noted:**

Plagiarism: Plagiarism is to take another person's ideas and present them as your own. This is nothing less than stealing someone else's intellectual property and behaving as if you were the rightful owner of this property. (The CUT *Student Assessment Manual* deals with the matter extensively. This Manual is accessible to staff and registered students on the CUT Intranet).

Data-handling: The way in which data is treated, secured and protected is also a matter of concern. The purpose of data is to serve as evidence in building an argument and should therefore be reliable. If data is misused, what guarantee is there that the data itself can be trusted?



Data misuse and abuse are dishonest and mislead the research community and the public as end-users of such information.

Safety of people and society: The results of scientific research are not meant to threaten or harm people and society, but should by their very nature encompass people, the environment, culture and systems in a non-harmful way. When the proverbial ‘Frankenstein monster’ is produced as a result of scientific endeavour, however, society will feel insecure and will then have the right to question the purpose of research, its results and impact. It is important to remember that integrity starts with the individual. The researcher is his/her own keeper. This also relates to the importance of stewardship for own intellectual interventions.

When the proverbial “Frankenstein monster” is produced as a result of scientific endeavour, society will feel insecure and will then have the right to question the purpose of research, its results and impact.

There is general agreement that in the training of researchers not enough attention is paid to the ethics of supervising research teams and postgraduate studies. Although it appears to be generally accepted that once the researcher has obtained a doctorate, he/she will automatically know how to behave with integrity in the research environment, this assumption is far from reality.

Impact of research: Another concern is that researchers very often overlook the impact of research on the environment, sustainable development, safety, security and business. In the research ethics curriculum these topics are not looked at attentively, and sometimes they are even ignored. The ensuing question is: *Who should look at what?* It is also alarming when the drive for the commercialisation of research is more about making profits than developing the scientific basis of a discipline. Greed is no virtue at all – in fact, using research only for profit may be seen as slaughtering the goose that lays the golden eggs.

The CUT expects that its staff and students will carry out the academic assignment with the highest ethical and scientific standards of academic integrity and performance.

Building a responsible research community: In building an ethical culture in science, one serious limitation is to think of research integrity only along the conventional lines of: plagiarism, copyright, fabrication of data, uncontrolled clinical research on human subjects and possible harmful effects on the environment.

To start with, ethics is the science of norms and values and how these other sciences should be applied to all human activities.

All sciences have an ethical dimension and are interrelated.

Integrity is associated with the trust that peers, funders, and the public have in research, the research process and the research outputs.

All sciences have an ethical dimension and are interrelated.



With this in mind, a number of guidelines have been established regarding norms and values for a responsible research community at CUT.

b) Code of Ethical Conduct at CUT

The CUT is committed to an ethical academic environment expressed through its core functions, namely teaching and learning, research and innovation, and community engagement. The CUT expects that its staff and students will carry out the academic assignment with the highest ethical and scientific standards of academic integrity and performance. *Academe* should adhere to those values that are universally recognised by the scientific community. Staff and students are also expected to live up to the institutional values of the university and the Constitution of the Republic.

To give effect to this orientation, the following ethical principles are supported:

Paradigmatic choices: Academics should be free to select the paradigm for their academic work and to form their own findings and conclusions based on scientific evidence. These findings and conclusions should be available for scrutiny and criticism as required by the university and scientific community's principles of fairness, openness, transparency and academic dialogue. It is expected of academics that they will conduct scholarly work in a way that advances knowledge while maintaining high ethical standards.

Dictum of "do no harm": The university commits itself to the ethical dictum of "do no harm" in all its activities. The university further commits to the universally accepted ethical values associated with the protection of human life, responsibility towards animal life, preservation of the environment, contribution to safety, security and sustainable development, integrity in human interactions and relations and the association with the common good.

Unfair benefit: Staff and students should at all times avoid situations that could contribute to an unfair benefit for the individual or behaviour characterised by greed. Although the notion of individualism is respected by the university, individualism should never be at the expense of other staff and students.

Creation of knowledge: Researchers should be committed to the creation of new knowledge that can enhance the *Vision 2020 Statement* of the university. The creation of new knowledge should promote the technology and innovation agenda of the university. It should by no means contribute to any situation where the safety and security of society is under threat.

Teaching and learning: Teaching and learning activities should be informed, relevant and contribute towards implementable and useful knowledge. No power relationship should be exercised between lecturer and student. Teaching and learning activities should be free from any form of harassment. Assessment practices should be fair and a just assessment of the newly gained knowledge of the student based on the evidence produced. This conduct relates to undergraduate and graduate education.



Postgraduate supervision: Teaching and learning at the postgraduate level should be driven from the perspective that the supervisor plays a supportive role in the student's discovery of new scientific knowledge. The supportive role should include assisting the student to delineate the research topic, to formulate appropriate research questions, to identify an appropriate research design and to develop the scientific and scholarly skills of the student. Having a supportive role implies that the different roles and responsibilities are well defined. This relationship depends on mutual commitment to the project and assignment, clear roles and responsibilities in the supervisory relationship and regular interaction on the basis of formative assessment.

Research teams: Research teams should behave at all times according to the ethos of their professions, live up to the expressed values of the professional and academic organisations and express collegiality and team work in the research that they have collectively and individually worked on.

Use of information and data: To preserve the integrity of research, researchers are obliged to report honestly and objectively, to avoid error and to disclose all important information. Objectivity in research imparts trustworthiness. This applies to both the *a priori* tasks of setting up the research and gathering the data and to the *posteriori* tasks of interpreting and publishing the results. This is critical so that future work built on the research will continue in an objective fashion.

Obligations of authorship: It is a researcher's obligation to publish results of research so that readers may be informed and be able to build on the reported findings. The methods and results should be sufficiently and accurately detailed with an objective discussion of its significance, so as to allow replication. Authorship should be in line with the Vancouver protocol. The principle of authorship is determined by an active contribution to the writing of the paper, the conceptual analysis of the paper and/or data analysis and interpretation of the paper.

Funding and grants: It is the responsibility of the principal investigator (PI) of the research team to ensure that the funding agencies' guidelines as well as the guidelines on the management and disbursement of funds provided by the university are followed scrupulously. It is not permitted to divert any research funds for personal or any other use, except in cases where the grant or contract specifically provides for this. Researchers who enter into agreements with commercial sponsors of research should familiarise themselves with the special terms of such agreements, especially those that pertain to the reporting of the results. Experiments not yet performed as evidence in support of the proposed research, are considered to be fabrication and are subject to a finding of research misconduct.

Funds and equipment: Staff and students have an obligation to use funds and/or equipment for the purposes for which they were awarded. Funds must be managed in such a way as to ensure that the budget is neither wasted nor misappropriated. Funds and equipment should be used in accordance with the awarding agency's requirements.



Risk: Key issues associated with the research on and with human participants are: evaluation of the risks and benefits of the research, informed consent, privacy and confidentiality, coercion and rewards. An evaluation of risk should take a participant centred approach, with the establishment of a threshold for normally acceptable risk. This threshold is generally set by determining the normal range of risk a participant encounters in everyday life. If the risk inherent in research participation does not exceed this standard, then the risk of participation could be seen as being within the threshold of normal acceptance.

An evaluation of risk should take a participant-centred approach, with the establishment of a threshold for normally acceptable risk.

Informed consent: Although partial disclosure and deception run contrary to the principles of informed consent, their use is acceptable as long as sufficient justification is provided. This justification must include that: (a) the identification of partial disclosure/deception as the only feasible method for achieving the research objectives; (b) none of the information that is withheld would cause the participant to refuse participation if the information was provided; and (c) the level of risk involved in participation is not withheld. A participant's involvement in research-related and/or community engagement must be through their own free will.

Privacy: Privacy involves the right to decide the extent to which personal data that is not already in the public domain may be disseminated. Confidentiality involves the preservation of a participant's right to anonymity. All possible steps must be taken to ensure privacy and confidentiality of all personal information. If privacy and confidentiality cannot be maintained, it is important that this situation be identified during the process of obtaining informed consent. It is also important that privacy be treated within the boundaries of existing legislation. A guiding principle for involving participants in research, research-related and/or community engagement activities is that of voluntariness.

Conflict of interest: The key to avoiding conflict of interest has to be trust in the integrity of the individual person to disclose any situation that could lead to real or apparent conflict of interest, as well as potentially conflicting relationships between academics, researchers and their team members, students, the university, external funding agencies and external institutions, organisations and communities, including those in collaboration and cooperation with the staff and students.

Execution of discipline: Direct relationships between staff/staff and staff/students must be avoided in the context where discipline must be exercised. In cases where such relationships do exist, the information must be put on public record. Situations where a spouse, child or family member is supervised must be discouraged. Where such cases do exist, an independent staff member must be in charge of executing discipline.

Hazardous material: The use and disposal of hazardous materials for teaching and learning, research, demonstration, or other purposes whether on or off the premises of the university,



but whose activities are associated with the university, will be subject to the provisions of existing legislation which must be complied with.

c) Ethical clearance

Research ethics is of the utmost importance as it portrays institutional and individual credibility and integrity. Research involving human participants is based on a moral commitment to advancing human welfare, knowledge and understanding, and to exploring cultural dynamics. This has become prominent especially where large-scale trials conducted in developing countries are concerned.

Of fundamental importance is the duty to conduct scientifically sound research while acting in the participant's best interests and respecting and protecting the participant's autonomy. Issues of informed consent are of particular importance, as specified in the Constitution of the Republic of South Africa of 1996.

Research ethics and integrity approval is recommended by the Research Ethics and Integrity Committee to the University Research and Innovation Committee (URIC) for its approval or notification.

Of fundamental importance is the duty to conduct scientifically sound research while acting in the participant's best interests and respecting and protecting the participant's autonomy.

d) CUT policies

The following policies direct research:

Policy on Attendance of International Conferences and Study Tours

Policy on Attendance of Conferences in South Africa

Policy on Research Grant Schemes

Policy on the Administration of the pay-out of funds for Research Projects

Policy on Financial motivation of Researchers for Accredited Research Outputs

Policy on the Recruitment and Appointment of Research/Postdoctoral Fellows

Policy on the Regulation and Recruitment of and Awarding of Grants to Postdoctoral Research Fellows

Policy on Ownership of Equipment bought for Research Projects

Policy of Surveys at CUT

Sabbatical Leave

Language Policy

VC Awards



Intellectual Property Policy
 Admission Policy
 Code of Ethics for Employees
 Code of Research Ethics and Integrity

Policies and forms are obtainable from the CUT Intranet and are in a continuous process of revision and update.

e) List of forms

Listed below are forms in areas of compliance to research policies:

- Application for approval of a research project/protocol LS 262
- Application for Research Grant Scheme Award LS 178.3
- Research Grant Scheme Acceptance Form (Agreement) LS 280.1
- Research Grant DATA sheet F281
- Control Data Sheet for monthly stipends payments F282
- Progress Report for M and PhD students (quarterly) LS 179.3
- Research Grant Scheme Annual Feedback Form Office form
- Amendment of title of a treatise/dissertation/thesis (consult with faculty) LS 263
- Appointment/Amendment/Addition of a Supervisor/Co-Supervisor LS 264
- Appointment/Amendment of Examiners (consult with faculty) LS 265
- Application to read a paper at an international conference/to undertake study visit F25 A
- Application to read a paper at a National Conference F25 B
- Attendance of Development Session LS212
- Claim for Travel & Subsistence Allowance LS30
- Claim for expenses paid by an employee LS30.1
- Application for Sabbatical Leave LS 288
- Sabbatical Leave Agreement LS 289
- Confirmation of Author when claiming for page fees Office form
- Asset addition acknowledgement form Office form

(Lists are obtainable from the CUT Intranet)

2.2.4 Other support, services and guidelines by R&D

a) Submission of accredited research outputs to DHET:

The Research & Development Unit submits institutional publications to the Department of Higher Education and Training (DHET) for continuous subsidy. For purposes of subsidy, the DHET recognises research in journals, books and published conference proceedings which meet the specified criteria outlined in their policy. The focus of subsidy is on 'scholarly publishing' which refers to publications by scholars (academics and experts) for a niche market consisting mainly of academics and researchers.

Faculties:

Faculties should submit all approved publication outputs for year (n-1) (as per DHET Grant) to the Research Office by 28 February of year (n). **To comply, faculties need to verify that proposed publications and conference proceedings fit into the DHET accredited publication categories.**

An article published in a DHET approved journal will be subsidised as a single (one) unit.

DHET does not subsidise all research outputs and the focus is on quality research and not maximum accrual of subsidy. This should be taken into consideration when recycling previously published work and dividing research outcomes between articles.

Similarly, when moving between institutions, author affiliation should reflect the institution where research was conducted, supported and funded.

When moving between institutions, author affiliation should reflect the institution where research was conducted, supported and funded.

Journals refer to peer-reviewed periodical publications devoted to the dissemination of original research and new development within specific disciplines, sub-disciplines or fields of study.

b) Books: page fees

Some accredited journals require the payment of page fees before publication of an article. The Research & Development Unit supports the following procedure:

- a) Obtain a quotation/invoice from the publisher of the journal.
- b) Complete a requisition in the following manner:
- c) Supplier: Name of Journal as indicated on quotation/invoice
- d) Use the general GLA/Cost centre
- e) Write the following description: Payment of page fees in respect of Dr/Prof./Mr/Mrs _____ article to be published in the _____ Journal.



- f) Reference number: Quote the reference/manuscript number on the requisition as it appears on the quotation/invoice.
- g) Sign the invoice and attach it to the requisition.
- h) Attach a copy of the article to the requisition.
- i) Obtain relevant signatures.

c) Subsidy of books

Books refer to peer-reviewed, non-periodical scholarly or research publications disseminating original research and developments within specific disciplines, sub-disciplines or fields of study. Only books that meet specified criteria in the policy may be subsidised.

A book may be subsidised to a maximum of 10 units or a portion thereof, based on the number of pages being claimed relative to the total number of pages of the book. Please revert to the DHET requirements and instructions policy on Book Publications for a guide on unit allocation for book publications (available from the DHET website).

A book may be subsidised to a maximum of 10 units or a portion thereof, based on the number of pages being claimed relative to the total number of pages of the book

Evidence of the pre-publication peer review process must be provided for every book or chapter submitted for subsidy.

Dissertations and theses that have been converted into books must be clearly identified as such and there must be evidence of substantial reworking and additional research carried out.

d) Published conference proceedings and conference attendance

Proceedings refer to the published record of a conference, congress, symposium or other meeting where the purpose is to disseminate original research and new developments within specific disciplines, sub-disciplines or fields of study.

Only articles published in approved conference proceedings are subsidised. Approved conference proceedings are those which appear in approved journal lists or other approved indices or those which meet the criteria laid out in the policy.

Where proceedings are published in approved journals, the output will be treated as a journal article. Kindly refer to the DHET website (www.dhet.gov.za) for requirements and instructions on Conference Proceedings.

Evidence of the pre-publication peer review process must be provided for every conference proceeding submitted for subsidy.



e) The development of a research plan

The University has an Institutional Academic Plan and a supplementary Research and Development Plan for 2014-2020. The latter is constantly implemented by the Research & Development Unit. Chapter 4 of this manual is devoted to the development of the research plan and the current strategies that are being implemented to realise the goals of the CUT's Vision 2020. These documents are also available on the CUT Intranet: *Academic Plan; Research & Development Plan; Research & Innovation Plan, and Vision 2020*

f) Grants administration and resource development

The Research & Development Unit administers various grants. The process to apply for CUT grant support is illustrated in Chapter 3 of this document.

g) Support to postgraduates and researchers at the Library and Information Services (LIS)

The Library and Information Services (LIS) resort under the Research and Innovation section. The LIS, from both Bloemfontein and Welkom campuses, provide scientific core and value-added resources and services, such as document delivery and interlibrary loan services.

These services enable researchers to access a wider range of research material. Subscription to databases is paramount in building research capacity. The LIS maintains subscription to twenty (20) databases allowing electronic access to more than 5 million specialised full text journal articles, including full text databases such as *EbscoHost, ProQuest, ScienceDirect* and *SA e-publications* (that have a wider coverage of peer reviewed journals). The LIS also maintains subscription to 52 e-book titles. It is important to mention that 7150 of the subscription journal titles have a link to Journal Citation Reports (using the JCR link), which indicates the impact factor of a specific journal title.

Throughout the year the Library and Information Services provide assistance to postgraduate students and staff in the following ways:

- provision of in-depth and complex information searches on behalf of the postgraduate student staff;
- provision of customised information searches for all faculties on both Bloemfontein and Welkom campuses; and
- provision of *RefWorks* and database training, including the functions and use of full text database, Internal Auditing Database training, PhD Database training and specific training for postgraduates.



Please make an appointment with your faculty's designated Information Librarian for more information on how to access these facilities and information searches:

Faculty of Humanities, Mr Amos Mkam	051-507-3470
Faculty of Management Sciences, Ms Lizette Storm	051-507-3168
Faculty of Engineering & IT, Mr Tshidi Jobo	051 507-3461
Faculty of Health and Environmental Sciences, Ms Jeannet Molopyane	051 507 -3144

Research books available in the LIS

There are currently more than four thousand **research-related** books shelved on the first floor, postgraduate research support section of the LIS, on the Bloemfontein Campus.

The supportive books fall within the following fields:

- the research process
- research method/methodology
- research writing/scientific writing
- research ethics
- research support



How we combat plagiarism

1. As part of the Personal Information Management Programme (PIM)/ Information Literacy Programme, all first-year students are trained at the LIS on how to use the correct referencing and citing techniques, and the importance of recognising other authors' intellectual property.
2. In the CUT Student *Assessment Manual*, plagiarism (and the consequences) is addressed extensively.
3. As part of the *Blackboard (e-Thuto)* function of e-Learning, all lecturing staff and supervisors have access to the programme *SafeAssign* that combats plagiarism in student assignments.

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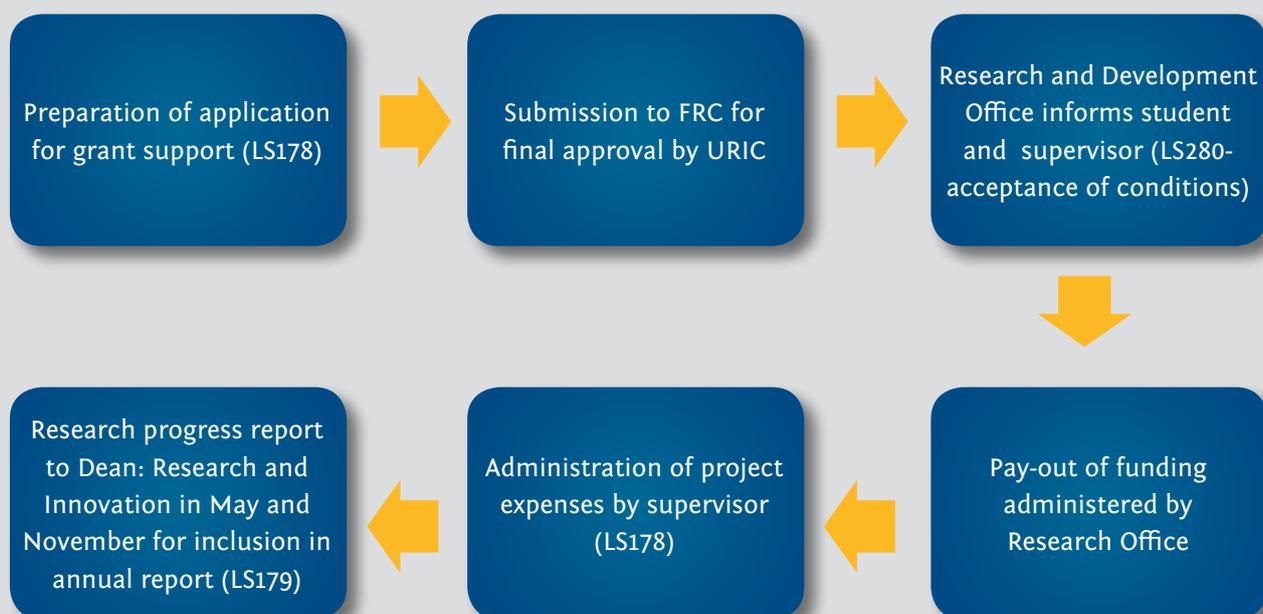
CHAPTER 3

Grant administrative services by Research & Development

3.1 Scholarship and grant applications

R&D's research profiles and programmes (Table 2 of this document) outline the available grant values for each programme category. Availability of grants will be subject to the institutions annual budget. Applications can be submitted at the end of July for award the following year and at the end of February for award in July of the same year. Policy guidelines are set by the Scholarships and Grants Committee. Consult your Faculty Research Manual for more faculty-specific details.

Process to apply for a CUT Research Grant:



3.2 External research funding

Every year research councils, foundations and other external bodies avail grants in various categories. Grants and bursaries are awarded to students, staff and rated researchers on a competitive basis to applicants who comply with a specific set of criteria during that period of funding. The following research councils/foundations frequently award grants to the CUT:



Agriculture Research Council (ARC)	www.arc.agric.za
Council for Scientific and Industrial Research (CSIR)	www.csir.co.za
Medical Research Council (MRC)	www.mrc.ac.za
National Research Foundation (NRF)	www.nrf.ac.za
Water Research Commission (WRC)	www.wrc.org.za

Guidelines for application to external research grant agencies:

1. Each faculty takes responsibility for the quality and scientific merit of grant applications. The Research Manager, in consultation with the applicant, supervisor and/or HOD will recommend to the Dean: Research and Innovation the approval of the grant to be submitted for external evaluation.
2. In cases where financial commitment is required (from the university to the funding agency) the application document must be submitted to the Research & Development Unit, in hard copy, ten (10) working days before the submission date.
3. In cases where administrative support is required, the application document must be submitted to the Research & Development Unit five (5) working days before the closing date for submission.
4. In cases where academic staff secure outside funding or other resources (such as sponsored visits, grants, awards, equipment, funding assistance, etc.) without any university support, but where resources will be utilised as part of their research assignment at CUT, the R&D Unit should be notified within 10 working days after the approval/allocation of such resources for record-keeping (and reporting) purposes.



NRF Call Schedule 2014

The following research funding opportunities are available from the NRF in 2014:

Call schedule for 2014		2013												2014											
Investment area	Funding instruments	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Established researchers	Bioinformatics									Call								X							
	Competitive support for rated researchers	Call					X			Call				X											
	Competitive support for unrated researchers			Call			X			Call				X											
	Incentive funding for rated researchers	Call					X		Call	X															
	SARCHI	Call					X	Call subject to availability of funds																	
	CoE	Call subject to availability of funds																							
Human and infrastructure capacity development	Career awards	Call						X					Call					X							
	Collaborative training groups (H,M,D,PD)	Call							X				Call					X							
	Drug discovery programme					Call						X													
	(M, D) Students with disabilities	Call subject to availability of funds																							
	Post-Doctoral	Call						X						Call					X						
	Sabbatical grants to complete PhD		Call					X			Call								X						
	Professional development programme (PD)	Call						X					Call						X						
	SHIP/DST Innovation and SSDF (M & D)	Call						X						Call					X						
	SKA scholarships programme													Call					X						
	Study support for completing PhD studies part time						Call					X													
	Thuthuka										Call								X						
Strategic knowledge fields	African Coelacanth Ecosystem									Call									X						
	African Origins Platform			Call			X			Call subject to Astronomy strategy															
	Blue Skies Research Programme			Concept notes				X		Call						X									
	Community University Partnership Programme	No call																							
	Global Change, Society and Sustainability Programme												Call						X						
	Human and social sciences grants	No call																							
	Indigenous Knowledge Systems			Call				X			Call			X											
	Integrated Biodiversity Information Programme								Call										X						
	Knowledge Fields - Education Research in South Africa	Call						X																	
	Multi-Wavelength Astronomy	Call						X					Call						X						
	Risk and Vulnerability Assessment Programme	No call																							
	SA National Antarctic Programme													Call					X						
	SABI-KFD South African Biosystematics Initiative	No call																							
	Society, Ecosystems and Change (SEA Change)	No call																							



Call schedule for 2014

Investment area				2013									2014								
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Applied research innovation and collaboration	Renewable & Sustainable Energy Scholarships (M,D)												Call				X				
	Research and Technology Fund			Call		X		Call subject to availability of funds													
	SANHARP Bursaries and School Outreach programme	Call subject to availability of funds																			
	THRIP												Call					X			
Strategic platforms grants	Competitive support for collaborative research with NF	Call subject to availability of funds																			
	Equipment-related mobility and training grants											Call						X			
	Research and Innovation Reward Programme			Call		X					Call							X			
	Research Infrastructure Support Programme			Call		X						Call						X			
	Nanoflagships Programme	Call subject to availability of funds																			
International relations and cooperation	Bi-nationals (SA - x)	No fixed timelines, call depends on negotiations with international partners																			
	Bi-laterals (NRF - x)	No fixed timelines, call depends on negotiations with international partners																			
	Focus on Africa	No fixed timelines, call depends on negotiations with international partners																			
	KIC	No fixed timelines, call depends on negotiations with international partners																			
	NRF/DAAD for Masters and Doctoral scholarships											Call							X		
Community engagement grants													Call					X			
Evaluation and rating of individuals	For 2014			Call																X	
		NB. The NRF reserves the right to modify this schedule without prior notice; however any changes will be communicated on our website.																			



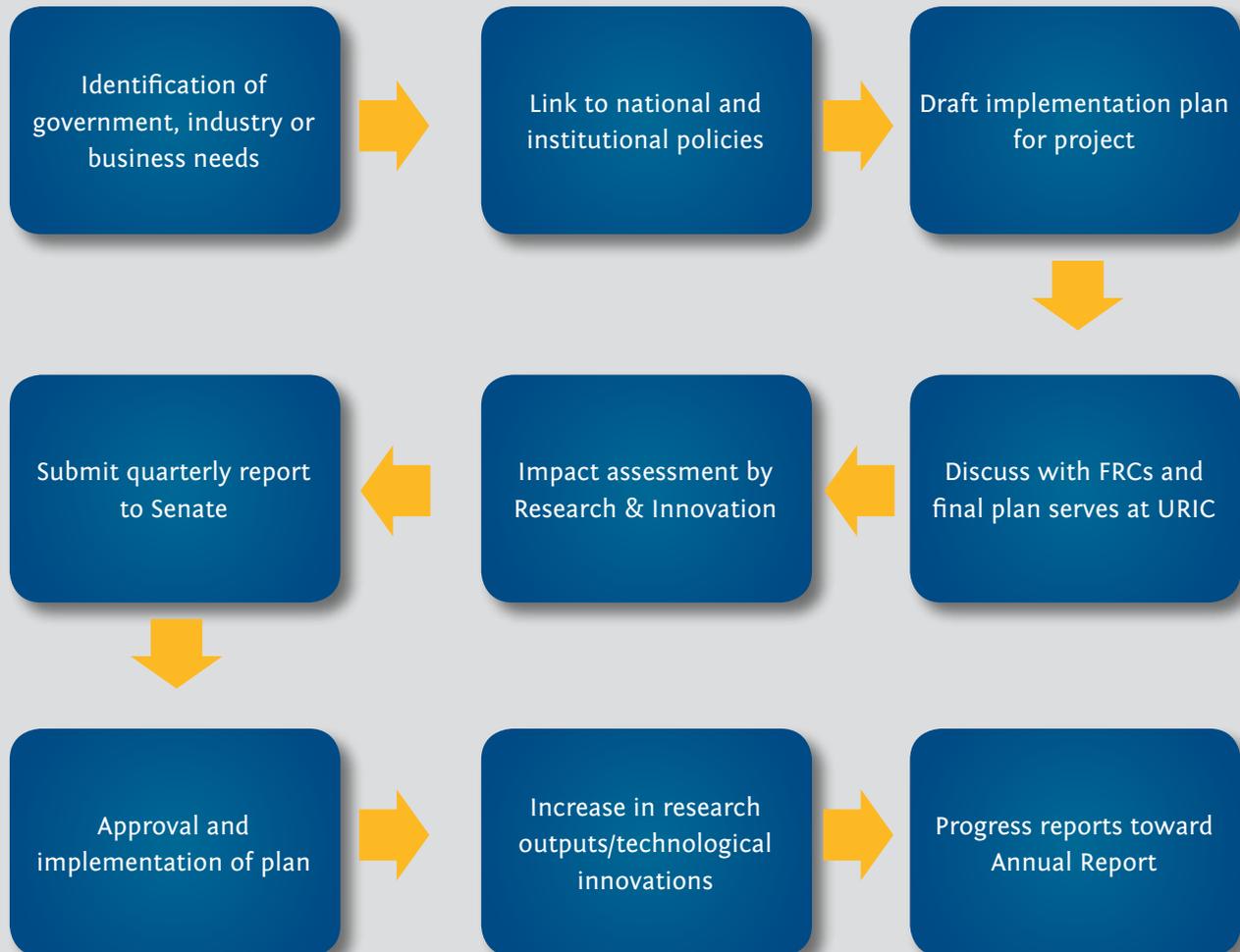
Steps in the external funding process



CHAPTER 4

Strategic research at CUT

4.1 Steps in research planning



4.2 Benchmark for strategic research programmes

It should be evident that the focus of all research development activities is that they result in outputs, outcomes and impact. Whilst an enabling environment is created in support of research, the policy directives and management of research are aimed at maximising the outputs, outcomes and impact. This approach corresponds with *Vision 2020* and international best practice in research management.

Policy directives and the management of research are aimed at maximising outputs, outcomes and impact.



The benchmark for Strategic Research Programmes includes:

- the number of postgraduate students enrolled and graduate;
- the number of postdoctoral fellows;
- the number of active researchers;
- the number of rated researchers;
- the amount of external funding awarded to the programme;
- the number of research publications in terms of books, articles and published conference proceedings; and
- commercial work.

4.3 Strategic research clusters

The identified research clusters and programmes are enablers for building a research and innovation culture. The identification of a research programme is based on the critical mass in a particular field of research, research outputs, completed qualifications and funding awarded. The cluster is based on a collection of related research programmes.

Although these clusters build strength in areas of focus, the principle of multi-, inter- and trans-disciplinary research via collaboration amongst listed programmes and various academic entities toward realising applied outcomes is also strongly supported.

Table 5: CUT research clusters and programmes

CLUSTER	PROGRAMME
Industrial Design, Communication and Development	New Product Development and Design Evolvable Manufacturing, Automation and Vision- Systems Sustainable Engineering Water Resource Management Information and Communication Technology
Quality of Health and Living	Applied Food Safety and Biotechnology Sustainable Farming Systems Applied Health Technology Environmental Assessment and Management Biotechnology
People and Skills Development	Socio-Economic Development Studies Leisure Management Education (sub-themes: Health Science Education, General Education, Service Learning, Academic & Professional Pedagogy, and Scholarship of Teaching and Learning) Research Education



CHAPTER 5

Research and Development Plan 2014-2020

5.1 Where were we?

The Central University of Technology, Free State's Research and Development Plan (2005 – 2010), emphasised three key areas for research and research development:

- the development of a sustained research culture;
- the improvement of research outputs; and
- the development of strategic research partners and programmes.

This plan was an institutional research plan to which various role players made a contribution. The faculties were responsible for the research outputs whilst the Offices for Research and Development, and Technology and Innovation (transfer) were supportive of these initiatives. This plan promoted the following objectives, concentrating on (1) research skills development and (2) the creation of an enabling research environment:

Objective 1: The development of staff and student researchers

Objective 2: Postgraduate retention and throughput

Objective 3: Increase in accredited publications

Objective 4: Sustainability of existing external funded research projects

Objective 5: On-going development of new SET research niche areas

Objective 6: Develop and sustain partnerships with public and private funding agencies and regional, national and international universities

Objective 7: Develop and sustain partnerships with business and industry

Objective 8: Increase the income through research projects

Objective 9: Develop postdoctoral research fellows as future research fellows

Objective 10: Market the CUT as regional leader in SET research

Objective 11: Develop opportunities to read papers at national and international conferences.



5.2 Where are we now?

The university's *Vision 2020* articulates four leading principles as: *Sustainable development*, *Socio-economic development*, *Input leading to outcomes* and *Outcomes leading to impact*. Consequently, the CUT's Research and Development Plan translated its activities into emphasising these four key goals:

- The development of a sustained, relevant and responsive research culture.
- The qualitative and quantitative improvement of research outputs.
- Socio-economic development through transfer and innovation.
- The development of strategic research and innovation partners and programmes.

The four leading principles became the main performance indicators of Research and Innovation. This approach corresponds also with international best practice in research management.

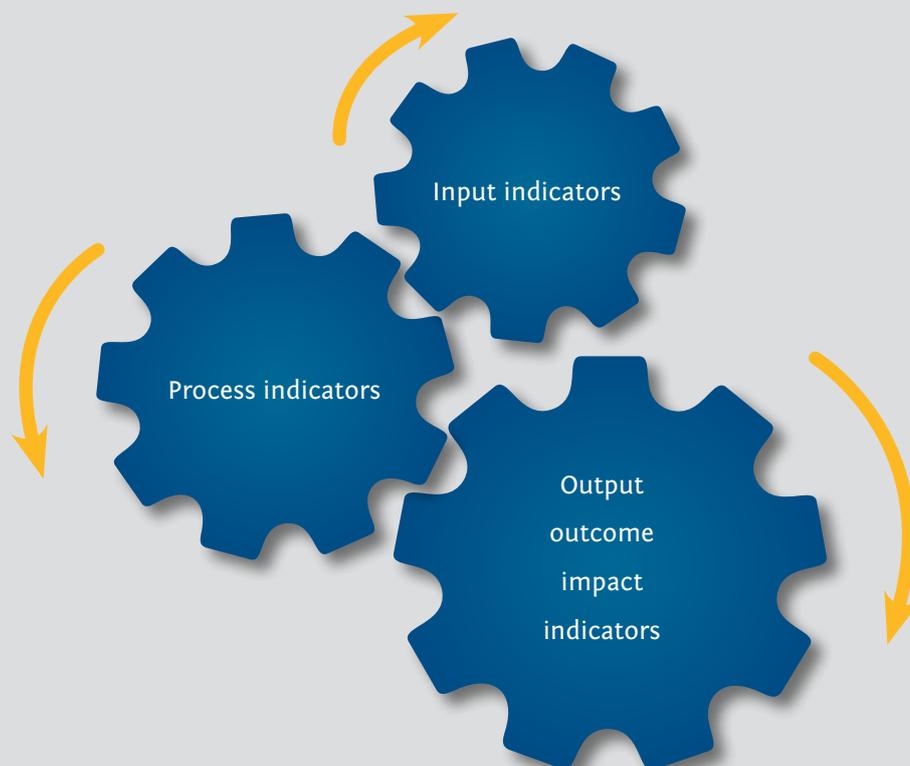
The input indicators are determined by what is available in the system: number of staff, students and budget.

The process indicators are the roll-out of the research programmes, training, conferences and funding applications.

The output indicators are the numerical results: number of qualifications, publications and grants awarded.

The outcome indicators are the overall results in terms of completed projects, growing of international footprint and qualification mix.

The impact indicators include commercialisation, citations, rated researchers, development of new policies and social change.



It should be evident that the focus of all research development activities is to result in outputs, *outcomes* and a certain *impact*.

The importance of the above mentioned approach is that whilst an enabling environment is created in support of research, the policy directives and management of research are aimed at maximising the *outputs, outcomes* and *impact*.

Research and Development Plan 2014-2020:

Table 6: CUT Research and Development Plan 2014-2020

Focus	Objective	Activity
Scholarly development through research and innovation training	Scholarly engagement with the research process and research cycle	Pre-Doctoral training Doctoral Training Post-Doctoral training Programme on postgraduate supervision Programme on scientific writing Programme on technology transfer and innovation Annual faculty research seminars Colloquiums and discussion groups
Research partnership development	Capacity growth of research projects	Multi-, inter- and trans-disciplinary research Joint ventures with national and international universities, research bodies and research councils Joint ventures with government/business/industry
Development of research clusters and programmes	Strengthening of research capacity	Student retention and throughput Publications Conference attendance Patents Rated researchers Research funding
Development of technology transfer and innovation	To develop the institutional level of involvement and expertise in technology transfer and innovation	IP Act of 2008 and Technology Transfer Office training Training of staff and students in innovation cycle Identification of research outputs for possible innovation Studying sustainable technological development Supporting the community in efforts at innovation and new product development

Note: Participation in related institutional and regional ventures such as the Regional Innovation Forum and the Free State Science Park Initiative are encouraged. These strategies will be directed by the *Technology and Innovation Plan 2014-2020*.



5.3 Where we want to be – the *next chapter*

The *next chapter* in developing a responsive research community is based on a number of agreed-upon principles and practices (reference URIC, AMF, MANCOM meetings).

These principles and practices are:

- growing the number of postgraduate enrolments to reflect 5% of all enrolments by 2020;
- growing the “seniorisation” of the academic profile (senior lecturers, associate professors and professors) to 50% of the total academic staff component by 2020;
- conducting GAP analysis throughout the various academic units to determine the shortcomings in the research value chain per academic staff member;
- academic staff participating in studies towards higher qualifications in their disciplines (aimed at decreasing the “juniorisation” of the system in favour of the “seniorisation” thereof) and/or increased participation in research outputs (primarily grant awards, publications, completed postgraduate studies and rated researchers);
- growing the number of rated researchers to 10% of senior academic staff by 2020;
- growing the number of publication outputs to be at 75% of the expected DHET norm by 2020 (currently the norm is 1.1 credit output-unit per fulltime academic staff);
- increasing the number of completed M degree studies by 100% by 2020;
- increasing the number of completed D degree studies by 150% by 2020;
- decreasing the number of years to complete postgraduate studies to fit into the current residential period for postgraduate studies (currently one year for full time Master’s and two years for full time Doctorate studies and four years for part time Master’s and five years for part time Doctoral studies);
- decreasing the dependency on institutional funding and growing the number of successfully awarded research grants; and
- increasing national, continental and international research footprints through partnerships, joint projects, joint funding and joint postgraduate offerings and supervision.

The university is mindful of the fact that growing the research culture depends on a number of institutional challenges that should be addressed. Some of these challenges as reported by the faculties are:

- workload – too much teaching time;
- uneven participation in research activities (internally – supervision, publications and externally grant applications);
- limited funding for staff and students (because of limited internal resources and low participation in external research grant applications);



- absence of well-equipped laboratories, outdated infrastructure, non-availability of relevant academic programmes and postgraduate students and a small critical mass contribute to limited participation in research activities.

The following objectives have been framed in the Research & Development Plan:

5.4 The strategies that we need

Based on the *capacity development model* (presented in Table 2) and the Senate-approved *Research & Development Plan 2014-2020* (presented in Table 6), the following strategies have been developed:

5.4.1 Human skills and potential development strategies

Strategy 1: Ten integrated support programmes to grow research capacities.

- Undergraduate to Graduate Students Programme
- Master's Education Programme
- Doctoral Education Programme
- Next Generation Researcher Programme
- Postdoc Fellowship Programme
- Emerging Researchers Programme
- Mid-career Researcher Programme
- Established Researcher Programme
- Black Female Researchers Career Programme
- Rated Researchers Programme

Strategy 2: Increasing the enrolment of postgraduate students.

Strategy 3: Growing the seniority of the academic staff profile.

Strategy 4: Introducing *research leave* to optimise opportunities for research participation.

Note: An important value of these strategies is the impact that motivational factors have on research performance that should be considered in all research activities.

5.4.2 Structural development strategies

Strategy 1: Reactivation the Graduate School in support of faculties.

Strategy 2: Implementing the approved constitution of the URIC.

Strategy 3: Training for Faculty Research Managers.



Strategy 4: Research and technology and innovation administrative support will be implemented at the Welkom campus from 2014.

5.4.3 Intellectual skills development strategies

The university provides opportunities to travel to conferences and to develop scientific writing skills as *input* and *process* indicators in support of the *output*, *outcome* and *impact* indicators.

Strategy 1: Rolling-out of scientific writing skills programme.

Strategy 2: Implementing revised INTERIM publication structure.

Strategy 3: Increasing the research outputs of the postgraduate students.

Strategy 4: Funding for conference attendance based on defined criteria.

Strategy 5: Rolling-out of institutional training programmes.

Strategy 6: Defining criteria for academic staff research outputs in a three-year cycle.

5.4.4 Resource strategies

Strategy 1: Allocation of institutional research grant.

Strategy 2: Allocation of DHET research and development grant.

Strategy 3: Revision of the allocation of publication incentives.

Strategy 4: Strategising the growth of research equipment and facilities.

Strategy 5: Revision of funding allocation to students.

5.4.5 Policy strategies

Strategy 1: Revising institutional research policies to reflect the new institutional framework for research and development.



5.5 University targets and faculty research plans

Consolidated total of committed outputs and targets projected for 2014-2020:

Table 7: Consolidated research targets

Totals of faculty projections	2014	2015	2016	2017	2018	2019	2020
Accredited articles/ credit outputs	73	84	98	110	127	143	153
Papers read at South African conferences	72	78	84	88	92	95	99
Papers read at international conferences	46	49	56	58	62	65	68
Patents	3	3	3	4	4	4	4
Staff with M degrees	147	152	158	163	168	175	185
Staff with D degrees	90	92	96	98	103	108	115
Students enrolled for M degrees	185	203	227	254	288	323	360
Students enrolled for D degrees	76	80	89	97	104	118	132
Post-doctoral Fellows	7	8	11	13	14	16	17
Completed M degrees	40	41	44	45	48	51	53
Completed D degrees	10	11	14	16	19	21	25
Rated researchers	9	12	13	13	16	16	17
External funding, excl. block grants	2.550 000	2.675 000	3.200 000	3.300 000	3.820 000	3.970 000	4.020 000



CHAPTER 6

Steps and stages in the postgraduate experience

6.1 What determines success in postgraduate studies?

The research process is one of interaction and support. No student can be successful without the support of his/her supervisor and the administrative assistance of the university. It is also important that postgraduate students be well acquainted with the processes and procedures of a university.

The National Qualifications Framework (NQF) prescribes the *core values* of a postgraduate qualification as: a comprehensive grasp of the discipline, critical understanding of advanced research methodologies, independent research, ability to conceptualise, advanced information retrieval, communication of research results, intellectual independence and the capacity to critically evaluate own and others' work. These values are the qualification descriptors and part of the assessment criteria for postgraduate research and supervision.

The *National Skills Development Strategy* and the *Human Resources Development Strategy* address the shortage of skills in the labour market and how postgraduate education, amongst other things, can address this shortage.

Core values of a postgraduate qualification

- Comprehensive grasp of a discipline
- Critical understanding of advanced research methodologies
- Independent research
- Ability to conceptualise
- Advanced information retrieval
- Communication of research results
- Intellectual independence
- Capacity to critically evaluate own and others' work

Postgraduate students are regarded as one of the most important resources within a university contributing to the development of new knowledge, as they are actively engaged in research.

6.2 What constitutes the Master's and the Doctoral degree?

6.2.1 The Master's degree

A **Master's degree** is an advanced academic degree granted to individuals who have demonstrated a mastery or high-order overview of a specific field of study, or area of professional practice. Within the area studied, graduates are posited to possess advanced knowledge of a specialised body of theoretical



and applied topics; high order skills in analysis, critical evaluation or professional application; and the ability to solve complex problems and think rigorously and independently.

Admission at CUT to a Master's degree is subject to the approval of the head of department. A student complying with all the requirements may register for a Master's degree. No person may register for a Master's degree unless he/she is in possession of an honours degree or a professional 480-credit bachelor's degree or equivalent qualification, as approved by the Senate, provided that the Senate considers the standard of study to be sufficient.

The **minimum duration** of the learning programme for a Master's degree at CUT is one year of full time study or two consecutive years of part time study. Any person enrolled as a student at CUT, while also holding a position at a place of work in terms of the Labour Relations Act (Act 66 of 1995), is considered to be a **part time student**, while any other student is considered to be **full time**. Except with the special permission of the Senate, a candidate may not be registered for a Master's degree for a period exceeding four years. Students are advised to consult the CUT *Calendar/Yearbook* for full details. (Obtainable from CUT Intranet)

Any person enrolled as a student at CUT, while also holding a position at a place of work in terms of the Labour Relations Act (Act 66 of 1995), is considered to be a part time student, while any other student is considered to be full time.

6.2.2 The Doctoral degree

A **Doctorate** is an academic degree or professional degree that, in most countries, qualifies the holder to teach at the university level in the specific field of his or her degree, or to work in a specific profession.

The term *doctorate* comes from the Latin *docere*, meaning "to teach." The "licentiate" degree shortened from the full Latin title *licentia docendi*, means "teaching license".

Doctorate degrees are the highest academic qualifications students and scholars of a subject area can earn. The Doctorate is generally awarded for a significant and original contribution to a field of study, outstanding scholarly or professional work, and the highest level of mastery in a particularly subject. However, there are varying views on what constitutes a 'quality' doctoral degree.

According to the HEQF, a doctoral degree requires a candidate to undertake research at the most advanced academic levels culminating in the submission, assessment and acceptance of a thesis. The defining characteristic of this qualification is high-level research capability, and a significant and original academic contribution at the frontiers of a discipline or field. The work must be of a quality to satisfy peer review and merit publication. The degree may be earned through pure discipline-based, multidisciplinary research, or applied research.

At CUT, the achieving of a Doctoral degree requires a minimum of two years' full time study, usually after completing a Master's degree. A graduate must be able to supervise and evaluate the research of others in the area of specialisation.



Admission at CUT to a Doctoral degree will be subject to the approval of the head of department. No person may register for a Doctoral degree unless he/she is in possession of an appropriate Master's degree or equivalent qualification, as approved by the Senate, provided that the Senate considers the standard of study to be sufficient. **Selection criteria** to a doctorate would include the quality of the Master's thesis in terms of language proficiency and skills in scientific writing. Furthermore, the relevance and quality of the Doctorate degree research proposal and the compatibility of the proposal with the CUT's research clusters are determining factors. The **minimum duration** of the learning programme for a doctoral degree is two consecutive years of full time study or three consecutive years of part time study. Any person enrolled as a student at CUT, while also holding a position at a place of work in terms of the Labour Relations Act (Act 66 of 1995), is considered to be a **part time student**, while any other student is considered to be **full time**.

Postgraduate students are regarded as one of the most important resources within a university contributing to the development of new knowledge, as they are actively engaged in research.

The student **registers** annually until the Assessment and Graduation Unit confirms that the qualification has been achieved. A student registered for longer than the required minimum duration of study is required to pay an extension fee upon registration, as determined annually by CUT. Except with the special permission of the Senate, no candidate may be registered for a doctoral degree for a period *exceeding five years*. *Please consult the CUT Calendar/Yearbook for full details.* (Obtainable from CUT Intranet)

6.2.3 Steps before registration

a) Drafting a protocol

A research protocol is a planning document. It embodies the thinking about the beginning, process and outcome of the study. In the research protocol you outline what you wish to study and how you want to study.

The process for drafting a research proposal:

Idea/draft topic → identified supervision → research problem/question → **research protocol** → approval → research process...

Normally a research proposal has the following elements:

- a working title
- background/rationale
- literature study
- research problems and objectives
- research design



- research methodology/methods
- time-frame
- outline of chapters
- references
- budget and resources

The protocol should be of a high standard and should include:

- a clear and informative problem statement;
- a clearly identified target audience;
- a well-organized and well-presented layout;
- a detailed explanation of research questions and aims;
- a title that reflects the contents of the study;
- compliance with the CUT's language policy; and
- a critical aspect to the study.

Each research project should be managed as an independent study.

A **faculty** should verify whether there is duplication of a study, against a kept list of registered titles. Moreover, faculties would accommodate SET themes, ensuring that the proposal fits into one of the identified programmes and clusters of the university.

The **Faculty Research Manager** will assist with the full set of documentation and assist with the procedures regarding the Research Proposal/Protocol as well as the identification, appointment, and agreement of a study leader/supervisor.

b) Identified supervision

In view of what research is and the role of the supervisor in postgraduate studies, it would be safe to say that postgraduate supervision is the active engagement of a supervisor in assisting the postgraduate student to identify a line of inquiry, to delineate the scope of a project within that line of inquiry, and to provide guidance that will lead to successful completion of the project and the dissemination of results.

The supervisor is instrumental in the student's drafting of a protocol in the following ways:

- The supervisor provides guidance and feedback to the student.
- The supervisor provides information regarding administrative procedures.

The supervisor debates the contents of the research project and provides perspective on the broader context of existing theories and latest trends in the field of study.



Supervisor/Student relationships and roles:

The “ideal” supervisor is someone who is available, knowledgeable about the subject field, helpful, stimulates ideas, critical, enthusiastic, involved and objective.

The “non-ideal” supervisor is detached, passive, a director, a partner, or a trainer.

The supervisor is an ADVISOR on research conduct and ethics, time management, overall goals, objectives and on the scope of the study.

The Supervisor is an EXPERT GUIDE and MENTOR on the selection of a topic, relevant literature choices, theoretical frames of reference, and research methodology.

The Supervisor is the “QUALITY CONTROL” for progress and project content, and does this by means of constructive feedback.

The Supervisor is a PASTOR by being a *sounding board*, being sensitive to personal matters and being alert to a student’s personal strengths and limitations. The supervisor is committed to the student’s success.

Postgraduate supervision is the active engagement of a supervisor in assisting the student to identify a line of inquiry, to delineate the scope of a project within the line of inquiry, and to provide guidance that will lead to successful completion of the project and the dissemination of results

The “ideal student”:

- adheres to the research contract/agreement;
- initiates contact and requests meetings in advance;
- is up to date with all institutional and formal requirements and rules (via the CUT *Calendar/Yearbook* and the CUT *Student Assessment Manual*);
- maintains interest and commitment throughout the study;
- plans and executes the research independently and with rigour.
- informs the supervisor of problems affecting the progress early in the project – there is openness and honesty from the beginning; and
- ensures that thesis drafts are dated, typed and spell-checked, language edited and meet all technical requirements in the required format of the thesis/dissertation.

Golden rules of engagement between supervisors and students:

- Dignity, respect and courtesy
- No (emotional, intellectual or sexual) harassment
- Accessibility
- Privacy
- Honesty



Students are advised to make optimal use of their time and effort during scheduled supervisory sessions. Students who don't schedule frequent meetings tend to overload the supervisor, expecting feedback on short notice.

It is always good to keep in mind that supervisors have no miracle solutions or suggestions and are not a substitute for reading up on a wide variety of topics in your field.

Some students hand in inferior efforts and expect the supervisor to make/highlight all the corrections; moreover, they often don't make the recommended corrections. This is not supervision...

Establish a good communication habit with your supervisor, for example to write down whatever was resolved at the last session, and what will be expected for the next. Frequent feedback and communication with your supervisor is essential at reasonable turn-around times.

If you have agreed on a due date for a piece of work, work very hard to keep to it. Do what you said you would do.

Supervisors want to maintain a very high standard, so don't force your supervisor to let you hand in for assessment if he/she doesn't propose or approve it to be ready for submission yet.

Keep in mind that your article submitted to a journal (as attachment to your thesis) assists as a "pass" in your final assessment.

Common mistakes

The distinguishing mark of graduate research is an original contribution to knowledge. To this end, the thesis must show two important things:

- a) identification of a worthwhile and relevant problem or question which has not been previously answered; and
- b) a solution or answer to the question.

The first most common mistake postgraduates commit is to not READ enough books, research reports/theses/dissertations, and scientific articles. Consequently, some try to 'hide' what has already been done in other similar studies and try to pose it in a thesis as a new idea. The mastery of the theory in the field of study along with a wide spectrum of knowledge on the most recent research results are the foundation of a good thesis.

Another common mistake is that some students underestimate the importance and long-term value of a protocol. The protocol encapsulates most of the "conceptual thinking" and forms the basic framework of the thesis.

The mastery of the theory in the field of study along with a wide spectrum of knowledge on the most recent research results are the foundation of a good thesis.



Students should not underestimate the work involved in acquiring a Master's or a Doctoral degree. A Master's degree will require 3000-5000 hours of hard work; the Doctorate may be more. There are no shortcuts.

It is common amongst students, when drafting a protocol, to tend to 'hide' possible problems that could hinder the study. Problems are much easier to rectify beforehand than during or after the study. Any unidentified problem will surface eventually. Rather anticipate and analyse as many potential risks as possible during the drafting of the protocol. Statements/hypotheses can be proved either right or wrong after the research is completed. Don't force a 'right'! The purpose of the protocol is to see to it beforehand that every applicable aspect of the research was clearly planned and thought through.

Another common problem is that of the thesis may turn out to be a 'comprehensive inferior effort' altogether. For a diploma or a B degree, 90% accuracy is fantastic. With an M or D degree, 90% accuracy of the research thesis is a total disaster. Everything must be a perfect 100% accuracy in the methodology and data-handling process.

A last common mistake is the tendency to become side-tracked during the research process. Stick to the topic and the protocol. It should be a topic of real interest, and after proposing the protocol, it should be put into action with dedication, consistency and clear focus.

Best practice

Start with a good protocol and a good supervisory arrangement/agreement. The supervisor/promoter must preferably be located close to you so that frequent visits/communications can take place.

Avoid overloading your supervisor with a reading assignment (to read an unedited chapter, for instance) and requesting immediate feedback, on short notice. Agree beforehand on a reasonable turn-around times, and stick to these.

Use one method of referencing, and use a logbook to document every detail correctly from the start.

Ensure that the title, objectives, arguments and research procedures correlate with one another; are linguistically properly formulated and logically appropriate. Ensure that the abstract and titles are in exact unison.

It is always good to keep the title-phrasing option open to the end of the project. The project could start with working title. During the last phases of the project, the title could be more accurately formulated.

The title should reflect the problem statement. You cannot conclude on something that the topic does not explicitly state.

A self-review is good practice. Be critical of yourself during the research process. Ask yourself "so what?" in relation to everything: this is a good practice to develop independent thinking.

The Library and Information Services (LIS) should be your second home. Make use of the specialised searches that are offered by Librarians.



The Library and Information Services (LIS) of CUT should be your second home. Make use of the specialised database searches that are offered by Librarians.

Attend the RefWorks workshop training, at the LIS, presented to postgraduates on how to access databases from the CUT's website, and how to apply automated citations from the RefWorks programme. These workshops are offered throughout the year.

The dedicated postgraduate research support section, on the first floor of the Bloemfontein Campus, LIS is a beautifully furnished postgraduate reserved area, open during library hours.



The Research Administrative Process Steps and stages in the postgraduate experience

Table 25: Administrative steps and stages in the postgraduate experience

STEP 1	MEET WITH HOD/FRM TO IDENTIFY SUPERVISOR AND PROJECT WITHIN RESEARCH CLUSTER Graduate visits Head of Department and Faculty Research Manager to discuss research project for M or D study Student is referred to Supervisor/Study Leader Student drafts conceptual proposal that is aligned with one of the university's research clusters
STEP 2	REGISTRATION Student registers upon approval of proposed research by faculty All INSTITUTIONAL / ADMINISTRATIVE PROCESSES will be dealt with by Student Administration Student complies with institutional regulations in Yearbook and Assessment Manual
STEP 3	FROM FACULTY TO R&D: APPROVAL OF PROTOCOL Supervisor and Co-Supervisor are formally appointed within the faculty Student formalises protocol (LS 262) Supervisor provides guidance to student and informs student about administrative process Title Registration Committee within faculty approves scientific merit of protocol and registers title on faculty database FRC submits approved protocol to URIC for ratification
STEP 4	GRANT APPLICATION Student applies for grant, Supervisor assists. Approval of grant will be based on institutional and faculty-specific criteria Student formally accepts grant conditions Grant registration on Research Administration System Quarterly progress reports via FRMs before pay-out of monthly stipends
STEP 5	PROCESS TO COMPLETION/ASSESSMENT Supervisor provides guidance Student utilises support and attends workshops offered by R&D Student submits article according to assessment requirements External examiner appointed to evaluate final dissertation/thesis Awarding of qualification



6.3 Scholarship

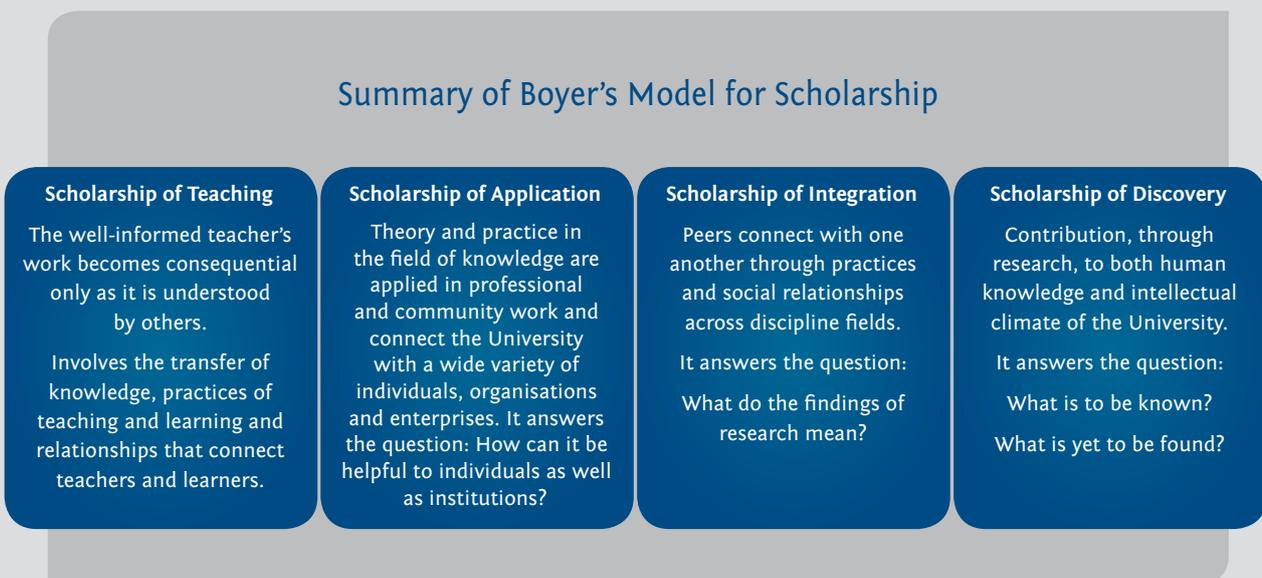
For centuries the term *scholarship* has had a very narrow definition. Today it is more broadly associated with methods, discipline and competence in research, and with mastering knowledge in close proximity with integrity and ethical values. Scholarship refers to the body of principles and practices used by researchers. It is characterised by its significant contribution to a particular profession, work that can be documented, work that builds on the foundation of other scholars and that can be elaborated upon, and work that is open and available for peer evaluation.

6.3.1 Boyer's Model for Scholarship

In the 1990 publication *Scholarship Reconsidered*, Ernest Boyer introduced an academic model advocating expansion of the traditional definition of scholarship and research into four types. The model has been embraced across the *academe* with occasional refinement.

Boyer proposed that scholarship includes four different categories and it is to be expected that any particular individual will have different patterns of working relationships within the four categories at different times. The following table summarises the model:

Table 26: Summary of Boyer's Model for Scholarship



(Boyer, E. L. 1990. *Scholarship Revisited, Priorities of the Professoriate: Special report of the Carnegie Foundation for the Advancement of Teaching*. Princeton, NJ: Carnegie Foundation for the Advancement of Teaching)

6.3.2 Habits of successful scholars

- Scholars are curious. They ask thoughtful questions.
- Scholars spend time pondering ideas and problems.
- Scholars view ideas and problems from multiple viewpoints and perspectives.



- Scholars save ideas, and document unfinished work so that they can revert back to it later.
- Scholars exercise their intellect by trying challenging tasks.
- They include all possible resources on a specific research issue and look at families of resources.
- Scholars set both short and long-term goals. They have a vision for their research.
- Scholars are prepared to learn and teach.
- Scholars consider themselves half-full: they exercise academic humility by realising that they have more to learn.
- Scholars realise that they can't be both "popular and effective" at the same time, therefore they take on difficult or unpopular tasks, transcending traditional ideas, rules and patterns, feeding the debates of the day and partner with originality.

6.4 Doing research

6.4.1 Four virtues in *doing* research:

- a) Your project should give evidence that you have *mastered* the research problem.
- b) Correct use of language, style and grammar.
- c) Footnotes, tables, figures and data should support your problem statement.
- d) Always **argue, argue** and **argue** the point.

The research report is not about recycling or replicating or summarising previous research, but rather it is about adding something new – providing a new perspective, based on what is already known. We expand on what has already been done in the subject-field through scientific writing.

Research is a process. It starts off with identifying the problem, doing the research, and generating results on the basis of the completed research.

The best way to start with any postgraduate study is to identify the technical requirements of the research project. Is it an Honours script/treatise/dissertation? Is it a Master's dissertation? Is it a Doctoral thesis? What are the technical requirements for the specific task?

6.4.2 Steps in *Doing* research

Once you have identified the requirements of your research project, employ the following steps:

Step 1: Identify the research problem. Why do I need to do this research?

Step 2: What is the hypothesis following on my research problem? What are the expected outcomes?

Step 3: What research methodology (ies) will be used to address the research problem?



Step 4: What research paradigm/framework is going to be applied?

Step 5: Immediately start with a literature analysis. Remember that you should consult literature that will reflect the overall and most recent debates in your field of study.

Step 6: Start with field work (data collection).

Step 7: What are your results? Write the research results.

Step 8: Do a self-review: Have you resolved the research problem? Can you validate your hypothesis? Does it provide a new perspective? Does it add to the field of knowledge?

Step 9: Recommendation to business, industry, government and social communities.

6.4.3 Writing the research report

Scientific writing is all about *getting back to basics* (reviewing on the basis of what is already known). The research report is not about recycling or replicating or summarising previous research, but rather it is about adding something new – providing a new perspective, based on what is already known. We expand on what has already been done in the subject-field through scientific writing.

Scientific writing is a constant process of refinement with a prominent level of reflection on materials from recent scientific accredited sources. It is a systematic approach that requires a specific style, format and line of thought. The contents should show a prominent level of reflection, which makes scientific writing an involved process of reading and thinking over your work – again and again.

Scientific writing implies rational and logical arguments with the aim of persuading readers that the investigation was reliable and the findings are valid.

Argumentation is a writing tool. Arguments should be presented logically and purposefully, leading step by step to a conclusion. The argument is the central idea that is explored and argued with evidence to back it up. A good argument needs good evidence. Take heed that your writing presents the arguments, not the process.

The author is a creator in his/her own right. In a research project the author knows the beginning, but not the end; therefore the writing should be more descriptive. However, when writing for a publication, the author already knows the end, right from the beginning. Therefore, the contents of the publication paper should be more reflective, and less descriptive.

The conclusions drawn from the research are important, and there should be a new contribution to the discipline. The conclusion is a presentation of the new, and is not a recycling of the old. On Master's level the research project usually adds something new to the knowledge base, but is more concerned about the *problem statement* than the *evidence* and *conclusion*. On Doctoral level the research project must add something new, with the bulk of emphasis more on the *evidence* and *conclusion*. In writing an article for publication, on the other hand, the author is *reporting* on the new knowledge and the emphasis would be mostly on the conclusion.



6.4.4 What can a reviewer tell from a List of References?

The first place any good reviewer will consult, even before reading the report, is the list of references. The reviewer will note whether the references used reflect the critical leaders/authors in that subject field or not.

By looking at the list of references the reviewer should be able to determine whether this will be a good paper or not.

From here, the reviewer would be able to spot the school of thought and determine whether the paper is going to be “a *potjiekos*” (a mixture of various schools of thought), *traditional* (only based on founding theories), or *ground-breaking* (addressing a gap in the critical and most recent aspects of the discipline field). By looking at the list of references the reviewer should be able to determine whether this will be a good paper or not.

6.4.5 Elements of a good research report

- Every applicable aspect of research is clearly explained in the report
- Writing for a pre-determined, selected reading public or target audience
- Accurate information
- Well systematised and scientifically correct without being uninteresting
- Short and concise to make reading easier
- Well-organised and compact without losing accuracy and comprehensiveness
- The report is be objective
- The report is stylistically correct and makes use of a definite referencing method, such as Harvard Method, the Augmented Harvard Method, the Numerical Method (ETC), or the Vancouver Referencing System, depending on the requirements of the subject field.



6.4.6 Steps in scientific writing

Steps in scientific writing link with steps of the research process, starting with the research problem that was articulated after a review of the literature (examples will be taken from rapid prototyping technologies as an example of Science, Engineering and Technology, and Customisation as an example from Management Sciences):

Table 27 Steps in scientific writing

Problem statement U	<p>What is the reason for writing the publication? Why is the topic you are writing on a problem? What makes it a problem?</p> <p>Note: <i>Verify the following: Does the problem deserve a 3000 word (at least) explanation and exploration?</i></p> <p>Example 1: You want to prove that through rapid prototyping technologies, moulds for industrial tools can be manufactured quicker and at a reduced cost.</p> <p>Example 2: You ask the question whether students are the clients of the university.</p>
Hypothesis U	<p>A hypothesis is an assumption that you want to prove through your research.</p> <p>Example 1: Rapid prototyping techniques are an improvement in the manufacturing of industrial tools.</p> <p>Example 2: Students perceive themselves to be clients of the university.</p>
Method U	<p>What research methods will you be using in solving your solution and proving your hypothesis? The following research methods can be used .</p> <ul style="list-style-type: none"> Survey research Causal comparative research Ethnographic research Correlational research Experimental research Evaluation research Basic research Clinical research Epidemiological research Social and behavioural research Applied research <i>Creative research</i>
Approach U	<p>There are seven virtues in academic writing:</p> <p>Virtue 1: You argue a point.</p> <p>Virtue 2: For each argument there is at least one reason.</p> <p>Virtue 3: A reason is supported by a literature reference/case study/experiment</p> <p>Virtue 4: You never make statements without being able to prove the statement.</p> <p>Virtue 5: Each argument can be validated.</p> <p>Virtue 6: Your argument must not only be able to support your view but also to counteract views that might differ from yours.</p> <p>Virtue 7: Your literature reference/case study/experiment must be the latest authority on your topic.</p>



critique & evaluation U	As you write your paper, you are continuously evaluating the arguments, always taking your problem statement and hypothesis into account. Does an argument support your problem? If not, shouldn't you revisit your problem statement and reconsider your hypothesis? There should be a constant alignment between the topic and the contents.
Conclusion U	In the conclusion you bring your arguments to a close and explain your solution to your problem, indicating whether your hypothesis is valid or not.

6.5 Other support

6.5.1 The Student Academic Support Centre

The Student Academic Support Centre in Bloemfontein is a newly built state-of-the-art facility that makes available the following services to postgraduate students:

- The Computer Lab 012 (ground floor), a space for postgraduate students with Internet access, Blackboard connectivity, MS Office software and a wireless connection for students using laptops or tablets.
- Exclusive study cubicles available for postgraduates are situated on the second floor.

Enquiries regarding study cubicles should be directed to Mrs Lynn van der Merwe, Tel 051 507 3350, lvdmerwe@cut.ac.za, Student Academic Support Centre.

6.5.2 Preparatory guidelines to undergraduate and graduate students

The university's aims for research should be explained in clear terms to graduates. The research-based learning element of postgraduate studies should be clearly understood.

The following preparatory guidelines are proposed:

- Consider continuation of studies on a postgraduate level.
- Consult the *CUT Calendar/Yearbook* for relevant information.
- Comply with all the requirements for registration.
- Align your envisaged postgraduate research project to the research clusters and programmes of the CUT (See Chapter 4).
- Pay special attention to the concepts and elements in the Research Methodology course that forms part of your current fourth year programme.
- Attend the supplementary research workshops that are presented at the CUT and ask as many questions as you possibly can. These workshops are designed to expose students



to, and engage students in research (accessible to all registered students, postgraduate students and staff, at no additional cost).

- You are also welcome to attend CUT workshops on academic literacy, language proficiency, and scientific writing.
- Before registering for postgraduate studies, consult with the Faculty Research Manager and Head of Department as a first entry point to assist you with identification of a research proposal and identification of a supervisor/study-leader.
- Find answers to the questions: What is research? Why should one do research? Why do universities do research? What are the products and effects of research in your field of study? Also read a wide variety of sources in your subject-field to learn what the latest trends and research gaps are.



CHAPTER 7

Glossary of terms and acronyms

Research for Development (R4D): has become a popular term and implies a paradigm shift: Science and innovation should be on the aid-effectiveness agenda with the net result of socio-economic and sustainable development. Research should create wealth and contribute towards quality of life.

Abstract: A synopsis that summarises the entire content. A concise overview which should not include information not reflected in the content. It must attract and excite and should be done last. It is advised that you start your paper with a working title, then formulate the title and write the abstract once you have completed the paper. The abstract is used to help the reader quickly ascertain the paper's purpose. When used, an abstract always appears at the beginning of a manuscript or typescript, acting as the point-of-entry for any given academic paper or patent application.

Affiliation of claims: The principle here is that the research stays where it was done. It belongs to the institute where the work was done.

Applied research: original investigation undertaken in order to acquire new knowledge and directed primarily toward specific practical aims or objectives.

ASSAf: Academy of Sciences of South Africa

Basic research: Original investigation with the primary aim of developing more complete knowledge or understanding of the subject under study.

Book: Books refer to peer-reviewed, non-periodical scholarly or research publications disseminating original research and developments within specific disciplines, sub-disciplines or fields of study. Only books that meet specified criteria in the policy of DHET are subsidised.

CHE: The Council for Higher Education is responsible for the development and management of the HEQSF (Higher Education Qualifications Sub-Framework) and for advising the Minister of Higher Education and Training on matters relating to the HEQSF.

CoE: Centre of Excellence – an establishment of the NRF/RISA in collaboration with the Research Chair initiative (see also the term: SARChI)

CRC: Central Research Committee, name is now changed to **URIC** (University Research and Innovation Committee) reflecting a broader context.

CRPM: Centre for Rapid Prototyping and Manufacturing.



CSIR: The Council for Scientific and Industrial Research (CSIR) is one of the leading scientific and technology research, development and implementation organisations in Africa. Constituted by an Act of Parliament in 1945 as a science council, the CSIR undertakes directed and multidisciplinary research, technological innovation as well as industrial and scientific development to improve the quality of life of the country's people. The CSIR is committed to supporting innovation in South Africa to improve national competitiveness in the global economy. Science and technology services and solutions are provided in support of various stakeholders, and opportunities are identified where new technologies can be further developed and exploited in the private and public sectors for commercial and social benefit. The CSIR's shareholder is the South African Parliament, held in proxy by the Minister of Science and Technology.

Curriculum: Is the prescribed courses/modules to be successfully completed before a qualification can be awarded.

CUT: Central University of Technology, Free State.

DHET: Department of Higher Education and Training.

Dissertation: Is the research report submitted in the prescribed format and in partial fulfilment of the curriculum of a master's degree (see also terms: Thesis and Treatise).

DST: Department of Science and Technology.

ETDP: Education, Training and Development Practices.

Ethics: See term: Research Integrity for a full definition in the research context, also see Montreal Statement.

FABLAB: An initiative of CUT that aims at technology transfer and promotion of SET to individuals and acts as a supporting structure for PDTs.

Formative Assessment: a process consisting of a variety of assessment opportunities (such as written tests, assignments and presentations) scheduled on an on-going basis and structured as part of teaching and learning during the course or module (see also term: Summative Assessment).

Frascati Research Classification of Basic and Applied Research:

- **Basic Research:** original investigation with the primary aim of developing more complete knowledge or understanding of the subject under study.
- **Applied Research:** original investigation undertaken in order to acquire new knowledge and directed primarily toward specific practical aims or objectives.

Footnotes vs. Endnotes: Footnotes are the kind of notes that appear at the bottom of each page. Endnotes are the kind that appear at the end of the document.



FRC: Faculty Research Committee, a structure at faculty level through which postgraduates apply for and obtain approval for protocols, assessments, and international travel.

GAP Analysis: Gap analysis identifies gaps between the *optimised allocation* and integration of the inputs (resources), and the current allocation level. This reveals areas that can be improved. Gap analysis involves determining, documenting, and approving the variance between requirements and current capabilities. Gap analysis naturally flows from *benchmarking* and other assessments. Once the general expectation of performance in the industry is understood, it is possible to compare that expectation with the company's current level of performance. This comparison becomes the gap analysis. Such analysis can be performed at the strategic or operational level of an organisation (Wikipedia).

Gibbon's Mode 2 Knowledge: This mode of knowledge production implies that knowledge production is produced in the context of application; it is trans-disciplinary of nature and responsive to societal needs.

HELSKA: Higher Education and Leadership Scarce Skills Academy.

HESA: Higher Education South Africa.

HEQSF: Higher Education Qualifications Sub-framework.

HOD: Head of Department.

IEASA: The International Education Association of South Africa (IEASA), a non-profit organisation, was established as a result of the need for universities of technology in South Africa to respond to international educational trends. If South Africa is to remain competitive within the global economic environment it is important that our higher education provides opportunities for students to obtain a global perspective to their studies. It also means that we open up international contacts which will benefit our students, our tertiary institutions and will assist South Africa to be a competitor and participant in world markets.

Incubator/ Incubation: A CUT initiative whereby a postgraduate researcher may continue with the development of a product or business in a small office currently situated at the FABLAB.

INORMS: International Network of Research Management Societies.

INSA: Indian National Science Academy.

INTERIM: An in-house, non-accredited journal of the CUT that serves as a unique tool for publication of work in progress.

Integrated Entrepreneurial Innovative Approach in Research: It is the ultimate aim to make an institution financially independent through the development and production of intellectual property.

IRDPP: Institutional Research Development Programme, a capacity development programme by the NRF focusing on "research niche areas", providing universities with the opportunity to



develop some of their focus areas according to IRDP criteria and submit them to NRD for consideration.

ISI: Institute for Scientific Information.

JNGS: Journal for New Generation Sciences – CUT’s own inter-disciplinary accredited journal.

Journal: A journal is a peer-reviewed periodical publication devoted to dissemination of original research and new developments within specific disciplines, sub-disciplines and fields of study. These include original articles, research letters, research papers and review articles. Only articles in **approved scholarly journals** are subsidised by DHET. Only complete, peer reviewed articles in journals are accepted for subsidy. The **DHET maintains a list of South African journals that meet the criteria** set out in their policy. (Obtainable from DHET website)

MGDs: Millennium Development Goals.

Montreal Statement: The Montreal Statement builds on the Singapore Statement, issued after the 2nd World Conference, which was the first international effort to set out common principles and responsibilities for research integrity. The Statement highlights four main areas: a) General Collaborative Responsibilities, b) Responsibilities in Managing the Collaboration, c) Responsibilities in Collaborative Relationships, and d) Responsibilities for Outcomes of Research.

NACI: National Advisory Council on Innovation.

NQF: The National Qualifications Framework has ten levels. Higher education qualifications occupy six levels of the NQF, namely levels 5 to 10. Levels 5 to 7 comprise undergraduate qualifications (with exception of the professional Bachelor’s degree at Level 8) and levels 8 to 10 accommodate postgraduate qualifications. Each NQF level has a level descriptor. Level descriptors provide guidelines for differentiating the varying levels of complexity of qualification on the framework.

NRDS: National Research and Development Strategy.

NRF/RISA: National Research Foundation – South Africa’s national agency for promoting and supporting research across all fields with the mission to contribute to the knowledge economy in SA attaining at least 2% of global research and development output by 2015. The NRF has a **rating system of individual researchers with a high level of credibility which is directly linked to funding of individual** researchers. **RISA:** Research and Innovation Support and Advancement is a process initiated by the NRF towards making interaction with the NRF more user-friendly, with a renewed focus on serving stakeholders and developing stronger partnerships with the NRF’s clients.

OECD: Organisation for Economic Cooperation and Development.



Organisational culture: Most definitions concede that human culture is a “shared system of meanings”. Organisational culture is therefore the system of shared beliefs in an organisational context.

Part time student: Any person enrolled as a student at CUT, while also holding a position at a place of work in terms of the Labour Relations Act (Act 66 of 1995), is considered to be a part time student, while any other student is considered to be full time.

PDTS: Product Development Technology Station.

Peer review: Peer evaluation of research is a fundamental prerequisite of all recognised outputs and is the mechanism of ensuring and enhancing quality.

Plagiarism: Plagiarism is the act of claiming or insinuating ownership of another person’s intellectual and/or academic contribution: this is a specific and very serious form of academic misconduct. Among other things, plagiarism includes:

- word-for-word copying of sentences or whole paragraphs from one or more sources (the work or data of other persons), or presenting of substantial extracts from books, articles, theses, other unpublished work such as working papers, seminar and conference papers, internal reports, lecture notes or tapes, without clearly indicating their origin or source. Such work should be referenced appropriately;
- paraphrasing of sentences or whole paragraphs from one or more sources (the work or data of other persons), or presenting of substantial extracts from books, articles, theses, other unpublished work such as working papers, seminar and conference papers, internal reports, lecture notes or tapes, without clearly indicating their origin or source;
- submitting another student's work in whole or in part;
- using of another person's ideas, work or research data without acknowledgement;
- submitting work which has been written by someone else on the student's behalf;
- copying computer files, algorithms or computer codes without clearly indicating their origin; and
- submitting work which has been derived, in whole or in part, from another person's work by a process of mechanical, digital or other transformation (e.g. changing variable names in computer programs). Also consult with the CUT *Student Assessment Manual*

Postgraduate supervision: Teaching and learning at the postgraduate level should be driven from the perspective that the supervisor plays a supportive role in the student’s discovery of new scientific knowledge. The supportive role should be informed by assisting the student to delineate the research topic, to formulate appropriate research questions, to identify an appropriate research design and to develop the scientific and scholarly skills of the student. The supportive role implies that the different roles and responsibilities are well-defined. This relationship depends on mutual commitment to the project and assignment, clear



roles and responsibilities in the supervisory relationship and regular interaction on the basis of formative assessment.

Proceedings: Proceedings refers to a published record of a conference, congress, symposium or other meeting where the purpose is to disseminate original research and new developments within specific disciplines, sub-disciplines and fields of study. **Approved conference proceedings are those which appear in approved journal lists** or other approved indices or those which meet the criteria laid out in the DHET policy.

Programme: According to HEQF a programme is a purposeful and structured set of learning experiences that leads to a qualification. Programmes may be discipline-based, career-focused, trans-, inter- or multi-disciplinary of nature. A programme has a recognised entry and exit point.

Qualitative research: A method of inquiry employed in many different academic disciplines, traditionally in the social sciences, but also in market research and further contexts. Qualitative researchers aim to gather an in-depth understanding of human behaviour and the reasons that govern such behaviour. The qualitative method investigates the *why* and *how* of decision making, not just *what*, *where*, *when*. Hence, smaller but focused samples are more often needed than large samples. In the conventional view, qualitative methods produce information only on the particular cases studied, and any more general conclusions are only propositions (informed assertions). Quantitative methods can then be used to seek empirical support for such research hypotheses (Wikipedia).

Quantitative research: This is the systematic empirical investigation of social phenomena via statistical, mathematical or computational techniques. The objective of quantitative research is to develop and employ mathematical models, theories and/or hypotheses pertaining to phenomena. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships. Quantitative data is any data that is in numerical form such as statistics, percentages, etc. In layman's terms, this means that the quantitative researcher asks a specific, narrow question and collects a sample of numerical data from participants to answer the question. The researcher analyses the data with the help of statistics. The researcher is hoping that the numbers will yield an unbiased result that can be generalised to some larger population. Qualitative research, on the other hand, asks broad questions and collects word data from participants. The researcher looks for themes and describes the information in themes and patterns exclusive to that set of participants (Wikipedia).

RAPDASA: Rapid Product Development Association of South Africa.

R&D: Research and Development.

RNA: Research Niche Area, for example, RNA for CUT is Integrated Product Development.



Research Clusters and Programmes of CUT: Programmes at CUT were integrated into three research clusters, namely: Industrial Design, Communication and Development; Quality of Health & Living; and People & Skills Development. Each cluster has several programmes.

Research Cycle: The process of taking the research problem through various academic stages (such as enrolment for postgraduate qualifications, publication writing, conference papers, supervision) to the process patenting (intellectual property), commercialisation (spin-in to business and industry and towards third stream income) and eventually production (spin-out and sustained third stream income). The full cycle is completed when research and innovation are used as a platform for engagement with and for implementation with communities, society, business, industry and government.

Research Integrity: The most known conditions for research integrity are: Do no harm to people; no plagiarism; no falsification of information; and no fabrication of information.

Research Management: This refers to the function of managing the research activities of the university for the purpose of creating new knowledge and the application of that knowledge for societal and commercial use. Research management is conceptualised within four quadrants: a) steering the process, b) identifying resources, c) impacting environmental factors (such as policies and strategies), and d) in the service of social communities, including business, government and industry (e.g. to improve quality of life and quality to end-users).

SANReN: South African National Research Network is a project to create a new National Research and Education Network in South Africa, providing its clients with both connectivity to the world's research networks and commodity Internet access.

SAQA: The South African Qualifications Authority is responsible for the development of policy and criteria for registering standards and qualifications on the NQF (National Qualifications Framework) and the CHE (Council for Higher Education).

SARChI: South African Research Chairs Initiative by NRF/RISA. See also Centre of Excellence (CoE).

SARIMA: Southern African Research and Innovation Management Association. SARIMA operates at an institutional, national and international level, as well as across the research and innovation value chain, from research management to intellectual property management and the commercialisation of research outputs. SARIMA interacts, liaises and forms strategic alliances and partnerships with other organisations as required.

Scholarship is noted by its significance to its particular profession, is creative, can be documented, can be replicated or elaborated, and can be and is peer-reviewed through various methods. The *historical method* comprises the techniques and guidelines by which historians use primary sources and other evidence to research and then to write history. The question of the nature, and indeed the possibility, of sound historical method is raised in the philosophy of history, as a question of epistemology. The *empirical method* is generally taken to mean the collection of data on which to base a hypothesis or derive a conclusion in science. The empirical method is



not sharply defined and is often contrasted with the precision of experiments, where data is derived from the systematic manipulation of variables. The experimental method investigates causal relationships among variables. The *scientific method* refers to a body of techniques for investigating phenomena, acquiring new knowledge, or correcting and integrating previous knowledge. To be termed scientific, a method of inquiry must be based on gathering observable, empirical and measurable evidence subject to specific principles of reasoning. A scientific method consists of the collection of data through observation and experimentation, and the formulation and testing of hypotheses (Wikipedia).

SETA: Sector Education and Training Authority. Recognising the dire need to improve skills development, the South African Parliament ratified the Skills Development Act in 1998, which defined a new Sector Training and Education Authority (SETA) system. In essence, the plan was to develop a series of sector skills plans within a clearly defined framework of the National Skills Development Strategy.

SET: Science, Engineering and Technology.

STEPS: Strategic Transformation of Educational Programmes and Structures at CUT. As part of the STEPS process, research methodologies and practices have been developed that are multi-, inter- and trans-disciplinary in nature.

STEM: Science, Technology, Engineering and Mathematics.

Summative Assessment: This is conducted on all the set learning outcomes of a course/module and is administered by the Assessment and Graduation Unit during June and November each year under the jurisdiction of Senate. It is an assessment opportunity assessing all or broad sections of the learning outcome identified for the course/module. It is the final assessment of the Master's or Doctoral study.

Supervisor: Is the person appointed, under whose academic direction and guidance a student completes studies. The **co-supervisor** is appointed to assist the promoter in discharging his/her responsibilities as supervisor.

Thesis: The research report submitted in the prescribed format and in fulfilment of the curriculum of a doctorate. The thesis is a formal document whose sole purpose is to prove that the student has made an original contribution to knowledge.

THRIP: The Technology and Human Resources for Industry Programme is a flagship research and development programme of **the dti** (Department of Trade and Industry) and the NRF (National Research Foundation). The NRF contributes research management and opportunities to leverage national and international research initiatives, so that the technology and industry development aims of **the dti** are taken forward effectively. This government- private sector partnership programme was established to respond to the shortage of high-level technical skills for industry and the need to improve the competitive edge of South Africa's industry through the development of advanced technologies. THRIP was launched in 1991. A major stimulus for the establishment of THRIP was serious concerns over the quantity and quality



of engineering graduates in South Africa. These concerns coincided with the increased recognition and attention government was giving to the importance of technology in economic development.

Treatise: Is the research report submitted in the prescribed format and in partial fulfilment of the curriculum of course work forming part of a master's diploma/degree.

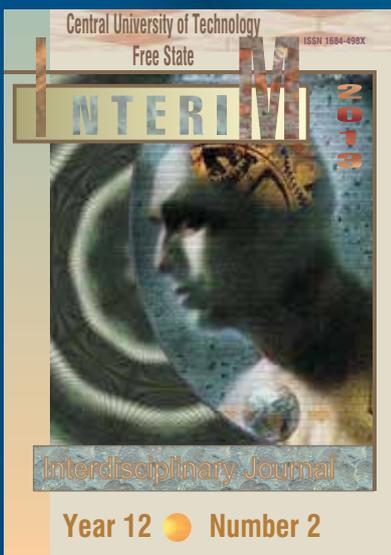
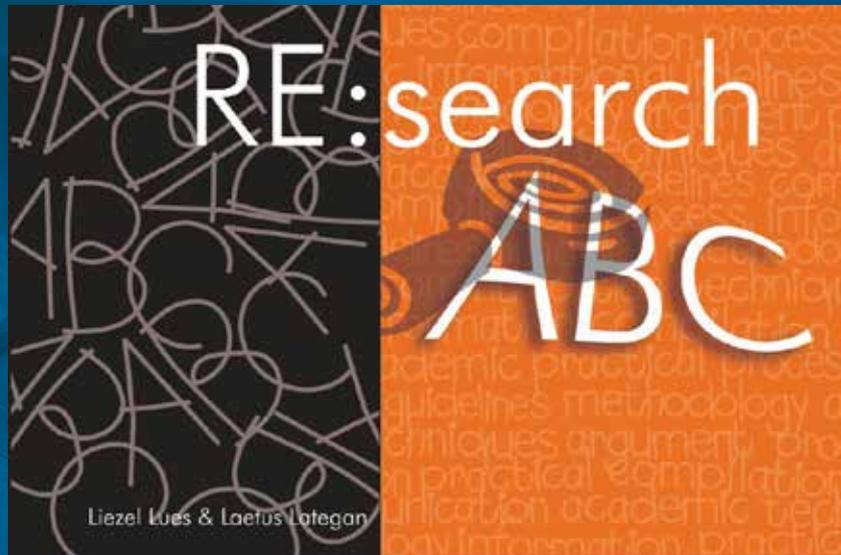
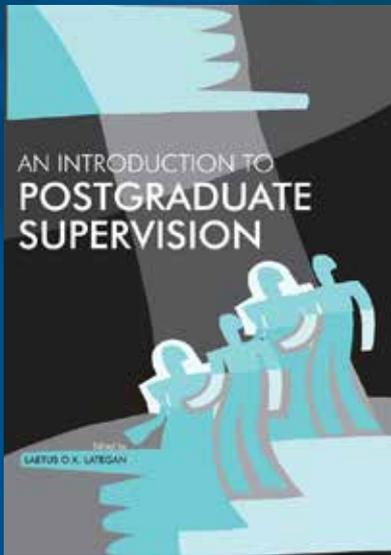
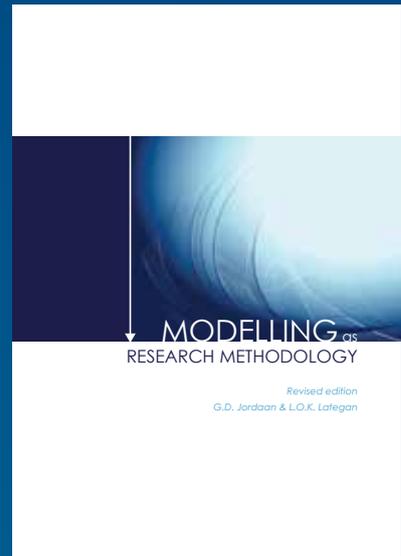
Triangulation: A combination of qualitative and quantitative research. Triangulation is a powerful technique that facilitates validation of data through cross-verification from more than two sources. In particular, it refers to the application and combination of several research methodologies in the study of the same phenomenon. It can be employed in both quantitative (validation) and qualitative (inquiry) studies. It is a method-appropriate strategy of founding the credibility of qualitative analyses. It becomes an alternative to traditional criteria like reliability and validity. It is the preferred line in the social sciences. By combining multiple observers, theories, methods, and empirical materials, researchers can hope to overcome the weakness or intrinsic biases and the problems that come from single method, single-observer and single-theory studies (Wikipedia).

Triple-helix approach: Depicts university innovation in a more prominent role with industry and government in a knowledge-based society.

URIC: University Research and Innovation Committee at the CUT as a committee of SENATE with certain approval and reporting delegations. The URIC will perform its functions through the following sub-committees: FRCs (Faculty Research Committees); GSC (Graduate School Committee); SGC (Scholarship and Grants Committee); IPSC (Intellectual Property Steering Committee); ICF (Innovation and Incubation Fund) and REIC (Research Ethics and Integrity Committee).

WIL: Work-Integrated Learning. Some qualifications will be designed to integrate theory and practice through the incorporation of WIL into the curriculum. WIL is characteristic of vocational and professionally-oriented qualifications, and may be incorporated into programmes at all levels of the HEQSF. WIL may take various forms including simulated learning, work-directed theoretical learning, problem-based learning, project-based learning and workplace-based learning.





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