



Central University of
Technology, Free State

2014

RESEARCH AND INNOVATION REPORT

SIGNIFICANT ACHIEVEMENTS OF 2014

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PART 1

Responses to
Research and
Innovation
(R&I) – 2014



Message from the Vice-Chancellor and Principal

Prof. Thandwa Mthembu

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This report reflects the range and diversity of our research and innovation activities, our researchers, our partners and collaborators, our communities and our support staff

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Welcome to our 2014 Research and Innovation Annual Report at a time when our institution is celebrating ten years as a university of technology. As you read through this Annual Report, I hope that one thing strikes you – the strides that the University has taken in embracing the importance of research and innovation as part of our education and a key driver in addressing policy imperatives and socio-economic challenges of the communities we serve.

This report reflects the range and diversity of our research and innovation activities, our researchers, our partners and collaborators, our communities and our support staff. In ensuring that we are reflecting on, responding to and anticipating the needs of our communities, we are always guided by and aligned to our Vision 2020 Strategy, Research and Development and Technology Innovation Plans.

Over the past ten years, the major question has been how we, as a university of technology, could reposition ourselves as a key player in the knowledge economy with unequivocal outcomes in the socio-economic development arena. To be able to address such a question, and the larger socio-economic challenges within our communities, we rely mainly on implementing programmes and resources which support research and innovation geared towards sustainable and socio-economic development.

In 2014, we see our university continuing to reflect a steady increase in its research outputs and introducing innovations which improve the well-being of the less privileged communities. Our research emphasis on technologies and innovations for sustainable development, quality of health and living and socio-economic and entrepreneurship development give testimony to our aspiration to integrate our research and innovation portfolio with the teaching and learning portfolio and the engagement portfolio. Over the past years the university has managed to increase its research and innovation footprint in our region, in the country, continent and globally.

Over the years we have witnessed a growth in our research outputs. For example, the publication outputs from 2012-2013 suggest a 16.2% growth. Whilst we are waiting for the official confirmation of the 2014 outputs, our own calculations show that we may be able to match this growth. Our publications in Web of Science Journals are nearing 50% of our total outputs. Master's and doctoral degrees awarded (2012 as base year in comparison with 2014 actuals) has increased by 66% and 80%, respectively.

The current staff establishment suggests that the university has realised a 32% increase on permanently appointed academic staff holding doctorates (2012 as base year in comparison with current) – an opportunity to dramatically grow the research outputs with the increase of staff participating in research.

All these initiatives reflect our vision for our university – which will be an institution of knowledge where there is opportunity to experience new things that will contribute to prosperity creation!

CUT was awarded the NRF Excelleration Award 2015 for achieving the most improved research performance over recent years.



Dr Beverley Damonse, Acting CEO, NRF; Prof. Thandwa Mthembu, Vice-Chancellor and Principal of CUT; Prof. Henk de Jager, Deputy Vice-Chancellor: Academic and Research, CUT; Dr Dorsamy Pillay, Deputy CEO: Research and Innovation Support and Advancement, NRF.

Prof. Thandwa Mthembu

Vice-Chancellor and Principal



Message from the Deputy Vice-Chancellor Academic and Research

Prof. Henk J. de Jager

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Our staff members made great strides in obtaining their doctorates, making CUT the leading university of technology with the highest percentage of academic staff holding doctorate degrees

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In 2014 we have continued on our exciting journey to align the academic project and our research and innovation programmes with Vision 2020, focusing strongly on *“producing quality social and technological innovations in socio-economic developments, primarily in the Central region of South Africa”*. Focused on our commitment to innovation and interdisciplinary applied research, we provided students with a rich educational experience that combines intellectual thoroughness and cross-disciplinary extensiveness in an intimate, student-centred environment. This commitment was illustrated in an increase of more than 50% in CUT’s Research Grant for 2014 approved by the Management Committee and Council.

The process of implementing the CUT Research and Development Plan 2014 – 2020 was further enhanced with the realignment of research entities and the development of a policy on research centres and units. Furthermore, ten research support programmes were successfully rolled out, to the benefit of staff and postgraduate students, and with the aim of increasing our research capacity.

During 2014, the university enhanced its collaboration with national and international partners, including the strengthening of research collaboration with the University of the Free State (UFS). The Merseta Chair in Engineering Development was established, CUT’s revised policy on intellectual property (IP) was approved, six patents and designs were registered, and a new series of business development courses were developed and introduced to the incubator tenants, staff and students. The Centre for Rapid Prototyping and Manufacturing (CRPM) continues with their ground-breaking work of designing, developing and manufacturing medical devices. Fourteen patients were assisted during 2014. In the process, CUT benefitted significantly from international

media exposure for this service, especially after two operations that were performed in Kimberley, Northern Cape.

Our staff members made great strides in obtaining their doctorates, making CUT the leading university of technology with the highest percentage of academic staff holding doctorate degrees. We are progressing towards reaching the 50% target by 2020. In addition, two more staff members obtained National Research Foundation (NRF) Ratings.

The various exciting research projects conducted by our postgraduate students and researchers during 2014 are indicated in the faculties’ and sections’ reports. I wish to express my sincere gratitude towards the Vice-Chancellor and Principal, CUT Council, members of Executive and Senior Management, the Section for Research and Innovation, students, staff and local and international partners who all worked tirelessly during 2014 to make outstanding research contributions. The support to CUT and the contributions from the Department of Science and Technology (DST), the NRF, the Technology Innovation Agency (TIA), Science Councils, the Department of Higher Education and Training (DHET) and several others during 2014 are acknowledged with profound sincerity.

In 2015 our contribution to society will be further underpinned by our research excellence, and we will continue to position CUT as the leading university of technology in South Africa and beyond.

Prof. Henk de Jager

Deputy Vice-Chancellor
Academic and Research



Message from the Dean: Research and Innovation

Prof. Laetus O.K. Lategan

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To further build and enable a research and innovative culture, a policy on Strategic Research Clusters – Research Centres, Units and Groups – was implemented

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As a university of technology, all research is inspired and guided by the vision to engage and focus on producing quality social and technological innovations aimed at contributing to the socio-economic development of the region. All research programmes are directed at solving problems in business, industry, and government – the triple-helix approach. The focus of research programmes is multi-, inter- and transdisciplinary in nature, with emphasis on sustainable development.

The implementation of research and innovation is supported by both internal and external financial resources, including subsidies, incentives, research grants, fee-paying services and donor or foundation funding, all which are used to leverage additional resources and research outputs.

The Research and Innovation Report 2014 presents and describes the activities and initiatives of the University in the areas of research support, research, innovation, and community engagement in line with the institutional Vision 2020 Strategic Plan. The University has continuously increased investment into different research and innovation initiatives and these investments are starting to yield positive results. During the year under review, the University has achieved a significant increase in the number of master's and doctoral degrees awarded, publications, number of rated researchers and postdoctoral scholarships. These initiatives were supported by numerous workshops covering multiple topics related to research.

To further build and enable a research and innovative culture, a policy on Strategic Research Clusters – Research Centres, Units and Groups – was implemented. These

research clusters are aligned to specifically identify research programmes based on the critical mass in a particular field of research, research outputs, completed qualifications and funding awarded.

In addition, good progress was made by the Technology and Innovation Unit through the revitalisation of the CUT Incubator, external funding, the registration of intellectual property and the contribution to research.

Within the various Faculties and Innovation Unit, integration of Community Engagement (CE) was more prominent in the Teaching and Learning category (19 projects), followed by CE and Innovation (four projects) and TL, CE and research (three projects). The Regional Innovation Forum of the Free State facilitated by a Department of Science and Technology (DST) grant also gained momentum through a number of significant regional development initiatives.

In conclusion, my deepest appreciation is extended to the many researchers, support units, the Council, Executive Management and external partners for their contribution to research and their unwavering support during 2014. The Annual Research and Innovation Report showcases our research activities for 2014 and sets the platform for sustained growth in a quest to achieving the University's strategic research goals.

Prof. Laetus O.K. Lategan

Dean: Research and Innovation

PART 2

Overall Review
of 2014



Seated: Prof. David Ngidi, Prof. Mike Mhlolo, Prof. Laetus Lategan, Ms Edith Sempe.

From left to right: Dr Moosa Sedibe, Dr Mahomed Mostafa, Prof. Albert Strydom, Ms Riana Dessels, Mr Sehlabaka Motsei, Prof. Alfred Ngowi, Ms Zenobia Louw, Mr Lerato Segalo

Absent: Profs Sam Mashele, Jorie Jordan, Crispin Chipunza

This Report reflects on the annual research and innovation activities.

During the period under consideration, some remarkable achievements were realised.

- A large number of staff and students are involved in and benefit from the academic support provided by the various Units.
- Existing and new initiatives attracted CUT staff and students and involve national and international partners.
- In all their activities, the emphasis is laid on the curriculum (now known as the STEPS process) and how staff and students can benefit from a connected curriculum (academic capitalism).
- In line with Vision 2020, the focus has shifted (but not ignored) that process should lead to outcome and impact and that impact should be measured. This will be a continuous process.

The following summative main-line activities and achievements in the different Units can be reported.

SIGNIFICANT ACHIEVEMENTS IN RESEARCH AND DEVELOPMENT (R&D)

The following achievements can be reported:

- Thirty-seven master's degrees awarded in 2014 compared to 29 master's degree students in 2013.
- Thirteen doctoral degrees awarded in 2014 compared to three doctoral degree students in 2013.
- 72% of the 2014 publication target was achieved up to end 2014. The final count will be reported to Senate after the audited submission is made to DHET.

- In 2013, the University had 55.02 journal credit units, 13.02 published conference proceeding units and 0.44 units for scientific books. This represented a weighted output of 0.24 units per academic staff member.
- In 2013, 30% of the staff held doctoral degrees as highest qualification and 38% held master's degrees as highest qualification.
- Six rated researchers in 2014. Four new applications for 2015 submitted in 2014. Three approved as from 2015. Total for 2015 will be nine rated researchers.
- Five postdoctoral scholarships awarded – one in the Faculty of Engineering and IT and four in the Faculty of Health and Environmental Sciences.
- R8.5 million external funding available for 2014 in addition to the R8.7 million external funding available for 2013. This includes multiple year funding.
- Comprehensive research manual completed and launched.
- R&D workshops on 28 February, 22 May, 4 August and 22 August. Collectively more than 300 attendees. These workshops reflected on multiple topics related to the research project.
- Public lecture on research ethics and integrity (Prof. Susan Tilley [Brock University, Canada]).
- Award for best master's student allocated to N. Nhlapo.

SIGNIFICANT DEVELOPMENTS AND ACHIEVEMENTS IN TECHNOLOGY AND INNOVATION

The Technology and Innovation Unit is one of the key elements in supporting the CUT achieve its various strategies. Good progress was made with the

following major challenges addressed by Technology and Innovation during 2014:

- Revitalisation of the CUT Incubator: In 2014, seven companies incubated in Bloemfontein. Four are functioning satisfactorily. Two entities incubated in Welkom. During 2013, five entities were all incubated in Bloemfontein. All discontinued at the end of 2013. The roll-out of the Vision 2020 Innovation and Incubation Programme: four innovation projects were financed in 2014.
- Securing the TIA's approval of the TIA Seed Fund agreement and the recruitment of qualifying participants in the programme: In 2014 TIA Seed Fund implemented. Four projects approved for funding and partially executed.
- Expanding the Intellectual Property portfolio of the CUT: In 2013 two IP registrations (two design registrations) processed. R5 600 NIPMO grant received as IP registration subsidy. In 2014 six applications for IP registration, consisting of one final patent, two provisional patents and three design registrations processed. NIPMO grant to the value of R5.8 million received to improve IP capacity.
- Securing ISO 13485 certification for CRPM: In 2013 staff underwent training. In 2014 consultant financed by TIA appointed to assist with certification application. Preparation: 50% of project completed.
- Both the PDTs and CRPM are financially still in a relatively strong position and functioning at a satisfactory level. In 2013, the CRPM had industrial projects to the value of R3 799 172 (a 14% increase on 2012) completed. R201 485 was spent on research projects during 2013. In 2014, 586 industrial projects to the value of R4 562 838 (an increase of 20% on 2013) were completed.

A total of R350 530 (an increase of 74%) was financed by the CRPM for 28 research projects. PDTs (with reference to the 3rd financial term due to Government's budgeting cycle): In 2013, 21 quotations accepted during the 4th term. In 2014, 40 quotations to the value of R493 783 accepted during the 4th term. TIA targets for 2014/2015 financial year already met.

SIGNIFICANT DEVELOPMENTS AND ACHIEVEMENTS IN REGIONAL INNOVATION

The Regional Innovation Forum of the Free State gained momentum through 2014, facilitated by a DST grant under its Regional Innovation Directorate to the CUT. In 2014, the Forum activities concentrated on the following:

- Administratively, the RIFFS constitution, composition and branding were completed. This also involved the (1) constitution of a Steering Committee as well as task teams on Awareness, Solution Exchange, Brainwave (Innovatorium and Slingshot) and Resources; and (2) placement of advertorials in the *Free State Business Bulletin* and *Volksblad*.
- Facilitated workshops and seminars: (1) Hosting of the CUT-OECD seminar on Entrepreneurial Education with Ms Janaa Puukka as guest, (2) the OVK-CUT Recipe Development Competition at the CUT Hotel School, (3) the Design@CUT Workshop towards submission of a business plan end 2014 that should lay the table for the furthering of entrepreneurial education and related initiatives at the CUT, and (4) presenting the Master Caterers Challenge together with the DETEA and ILO at the CUT.
- Partnerships and collaborations undertaken: (1) Partnered with ABSA/Barclays with regard to the Inspiring Entrepreneurs Seminar via web-feed help on the CUT campus, (2) partnered with ILO to establish an ILO-CUT SMME Incubator, (3) partnered with the UFS and Da Vinci Institute to establish a train of thought and associated skills development strategies, (4) partnered with FSDTEA DRAC (DETEA Research Advisory Committee) towards the establishment of a priority research catalogue for the region.
- Feasibility Study: Received the task to establish a Fuama Village Science and Innovation Park by means of a handover of the feasibility study done by the DST and the UFS.
- Members of RIFFS have attended a number of developmental events such as the South African Innovation Summit and directive meetings on innovation and technology transfer.
- A progress report was submitted to the DST in August 2014 on the expenditures of the DST account – this was approved by the DST for utilisation by the end of the 2014/2015 financial term in March 2015. A comprehensive business plan and contract were submitted to the DST in November 2014 to secure follow-up funding for the 2015/2016 financial period.



SIGNIFICANT DEVELOPMENTS AND ACHIEVEMENTS IN LIBRARY AND INFORMATION SERVICES

A fundamental aspect of Library and Information Services (LIS) work to support research was building the LIS collection to advance research.

In 2014, the LIS made the following progress and achievements towards supporting research:

- A total number of 882 students attended the library orientation at the Bloemfontein Campus while 311 are on record as participants in the orientation programme at the Welkom Campus.
- The CUT Library joined the library fraternity across the country to commemorate the Library Week in March. Among the major events organised for the CUT community were the unveiling of the CUT Institutional Repository and the launch of the EBSCO Discovery Service.
- The LIS took a major step in expanding the range of library resources to support teaching, learning and research by piloting subscription to e-books. Through this initiative, no less than 2 500 titles were accessible to the CUT community focusing on STEM. In view of the pattern of usage, the results were already very encouraging by the end of 2014.
- Another important event was a colloquium organised on copyright during the celebrations marking the World Book and Copyright Day in April.
- Based on the comparison of data collected in 2013 and 2014, the LIS showed significant improvements in statistics in services offered ranging from training of library clients to transactions recorded in critical areas such as inter-library loans, cataloguing processes, database usage and circulation of library materials.

SIGNIFICANT DEVELOPMENTS AND ACHIEVEMENTS IN COMMUNITY ENGAGEMENT

At the CUT, various milestones have occurred which facilitated the mind shift *Engaged Scholarship*. The CE Plan and strategy is commendable. It takes cognisance of Vision 2020, the National Development Plan 2030, the White Paper 3 (1997) and the Post-School White Paper 2013. This inclusivity promotes the idea that CE in many forms has become a part of the work of universities in South Africa.

The CE model advocates the integration of all three missions and an 'engaged scholarship'. Research improves teaching as new knowledge is generated. Further, it inculcates the notion of Spin and Spin out via entrepreneurship/innovation/incubation via quadruple relationships.

During 2014, the following activities also took place. The Faculty of Management Sciences had the highest number of projects (9), followed by the Faculty of Engineering (6), the Faculty of Health and Environmental Sciences (6), Humanities (2) and Schools Advancement Academy (3).

The projects took place within the following five categories: (1) Integration of Teaching and Learning and CE, (2) CE and Innovation, (3) Research and CE, (4) Teaching and learning, research and CE, and (5) CE, TL, Research and Innovation. Integration of Teaching and Learning and CE is prominent with 19 projects utilising this category, followed by CE and Innovation (4 projects) and Teaching and learning, research and CE (3 projects). There are currently no projects which encompass CE, TL, Research and Innovation.

The model of CE at the CUT has evolved over the years to encompass a more comprehensive suite of services for CE. This suite takes into account the socio-development of communities and takes cognisance of the OECD Report 2012. The Focus Areas are Development and Education. These two foci areas have four activities: (1) promoting human dignity and health, (2) empowerment, (3) increasing social capacity, and (4) sustainable development.



PART 3

Institutional
Performance
Reviews and
Support

Faculty of Engineering and Information Technology



A Message from the Dean

Prof. A Ngowi

One of the most fundamental pillars of a research culture at a university is the presence of research-active academics. Over the past few years, the Faculty of Engineering and Information Technology (FEIT) has put concerted effort into building a critical mass of research-active academics through recruitment of reputable and well-established researchers as well as encouraging and supporting staff to acquire higher degrees.

The outcome of this effort is already visible in the gradual annual increase of research outputs over the past three years as well as the number of research entities (centres, units and groups) established in the Faculty recently. While this effort is on-going, the Faculty is now concentrating on getting re-

searchers to apply for external research funding, both nationally (such as the various NRF schemes) and internationally (such as the Erasmus Mundus programme).

FEIT is also encouraging and supporting staff to develop personal research profiles that will make them eligible for rating as NRF-rated scientists.

In order to meet our share of the 2020 institutional target of rated scientists, the Faculty has encouraged all academics to place their profiles on the NRF database and update them regularly so that they can become aware when they meet the criteria for rating into the various NRF rating categories.



A Message from the Research Manager

Dr M. Mostafa

The Faculty of Engineering and Information Technology (FEIT) offers a wide range of research activities over seven research programmes, namely Advanced Manufacturing, Robotics, Automation and Vision Systems, Energy and Sustainable Engineering, Sustainable Built Environment, Water Resources Management, Applied ICT Systems Engineering, and Educational Technology.

In 2014, the research at FEIT faced significant improvements. It accumulated 27 publication credits and 74 conference papers. Moreover, the FEIT researchers went externally to seek funds for their research and they attracted more than R1.4 million. FEIT also graduated 22 post-graduate students and three of its staff received NRF recognition as rated researchers. Two postdocs joined the Faculty while a patent was registered. The Faculty received

two (out of a possible three) VC staff excellence awards in research categories which is an outstanding achievement. Departmental seminars became a tradition at FEIT while the annual research seminar still runs smoothly with increased interest from the industry.

It is worth noting that the Faculty of Engineering and Information Technology hosted a research workshop entitled 'Creating and Sustaining Conducive Research Environment' on 20 August 2014.

A high-profile keynote speaker, Prof. Adam Habib, who is the Vice-Chancellor and Principal at the University of the Witwatersrand (Wits), graced the event. This workshop aimed at boosting the research culture at the Faculty.

“It is worth noting that the Faculty of Engineering and Information Technology hosted a research workshop on creating and sustaining a conducive research environment

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NARRATIVES ON RESEARCH GROUPS AND PROJECTS IN THE FACULTY

Association of African Universities (AAU) Grant

Mr SO Eromobor, lecturer in the Department of Built Environment at the CUT, is the privileged recipient of the Association of African Universities (AAU) research grant of US\$3500.00 in the year 2014 for his ongoing doctoral research project "Sustainable design of built infrastructure and engineering services for South African universities." The AAU is the apex organisation and forum for consultation, exchange of information and cooperation among institutions of higher education in Africa and which encourages scientific postgraduate investigations on the continent through financial supports. The focus of Mr Eromobor's research is to develop a framework and evolve guidelines to achieve energy efficiency, water use efficiency and quality indoor environment in the buildings of South African universities by integrating natural elements and the appropriate design of buildings. The research is being conducted in collaboration with the Department of Civil Engineering and the Department of Built Environment at the CUT under the supervision of Drs Dillip Kumar Das and Fidelis Emuze. The grant has contributed immensely towards ensuring successful conduct of some of the activities like data collection, local travels, purchase of equipment and other related project expenses. Beyond the significance of the funding received from the AAU, it provides opportunities for continuous engagement and exchange of information from members of the AAU, which is not only beneficial to Mr Eromobor, but also to the CUT.

In 2014, Mr GM Muriithi, Lecturer at the Department of Information Technology, received a grant amounting to US\$3500.00 from the AAU under the Small Grants for Theses and Dissertations. Mr Muriithi is currently

pursuing his PhD (Computer Science) at the University of the Free State (UFS).

CSIR National Laser Centre

The CUT was a contributor in the development of the South African Additive Manufacturing Technology Roadmap. The CUT is also a key player in the Collaborative Program in Additive Manufacturing with the SU, VUT, NLC, UCT and NWU. The DST funding for this was approved late 2014.

DST Titanium Centre of Competence Programme

CRPM was awarded R230 000 for 2014 under the ongoing Titanium Centre of Competence (TiCoC) collaborative programme. This programme was established under the Advanced Metals Initiative funded by the Department of Science and Technology. The aim of the TiCoC is to add value to South Africa's titanium resources with the CSIR, Aerosud, VUT and the CUT developing a unique suite of laser additive manufacturing systems and processes. This is the sixth consecutive year that the CUT received funding under this collaborative programme.

Optical Monitoring of Selective Laser Melting Process Patent

A patent application for in-process monitoring of Selective Laser Melting (SLM) has been filed. This invention relates to a method and device for in-process monitoring, measurement and control of the geometric characteristics of 3-D objects produced by SLM. The proposed system will create real-time reports and a "passport of quality" of SLM manufactured objects with estimated porosity and location of probable defects. It also makes provision for a feedback controller to optimise the quality of manufactured products.

FOSTERING STRATEGIC PARTNERSHIPS

The following research partnerships were fostered:

Institution	Nature of partnership	Activities in 2014
Department of Electrical, Electronic and Computer Engineering		
Stellenbosch University	Research Partnership	In partnership doing collaborative research projects since 2007. Currently busy with Phase 3 of project that is externally funded to the value of R2 750 000. Also act as external examiners both ways.
ULM Applied Science University in Germany	Academic and Research Partnership	The activities include: Student exchange, Staff visits, Research collaboration, and External examiners.
KIST University in Rwanda	Research Partnership	Staff member of KIST University completed his doctoral studies within our department.
CBI Electric	Industry Partner in Research Project	Our industry partner with our research project in collaboration with Stellenbosch University. Visits to assembly plant and we are busy developing a technology demonstrator for CBI for possible implementation.
Department of Civil Engineering		
University of Illinois	Research Collaboration	Dr Mostafa initiated contacts with the Illinois Centre for Transport (ICT) in 2014. He visited the ICT in January 2015 and agreed on activities for 2015.

COMPLETED MASTER'S DEGREES

Bihi TG. 2014. *Assembly-setup verification and quality control using machine vision within a reconfigurable assembly system*. Central University of Technology, Free State.

Niemann JA. 2014. *Development of a reconfigurable manufacturing system with enhanced control capabilities and virtual commissioning*. Central University of Technology, Free State.

Pereira MFVT. 2014. *Additives manufacturing of components for in-die cavity use, suitable to withstand Aluminium High-Pressure Die-Casting (HPDC) process conditions*. Central University of Technology, Free State.

Burger EA. 2014. *Urban planning approach for improvement of road safety in suburban arterial roads of Bloemfontein city, South Africa*. Central University of Technology, Free State.

Tetsoane ST. 2014. *Evaluation of SWAT model in simulating catchment hydrology: Case study of the Modder River Basin*. Central University of Technology, Free State.

Kuriakose EB. 2014. *A cost-effective school management system for disadvantaged schools in the Free State Province using Software as a Service (SoaS) delivery model*. Central University of Technology, Free State.

Van de Linde PL. 2014. *A comparative study of three ICT network programmes using usability testing*. Central University of Technology, Free State.

Smith LC. 2014. *Development of a reconfigurable assembly system with an integrated information management system*. Central University of Technology, Free State.

Mkhonto M. 2014. *The effective government information accessibility system for a community in the remote areas of South Africa*. Central University of Technology, Free State.

Completed Doctoral Degrees

Kotze BJ. 2014. *Navigation for automatic-guided vehicles using omnidirectional optical sensing*. Central University of Technology, Free State.

List of 2014 International Conference Proceedings

Aiyetan OA & Das D. 2014. Using system dynamics principles for conceptual modelling to resolve causes of rework in construction projects, 32nd System Dynamics Conference, Delft, Netherlands, Conference Proceedings.

Aiyetan AO & Akinradewo FO. 2014. Evaluation of factors contributing to disparity in preliminary estimate and final cost of building projects. Proceedings of CIB W107 2014 International Conference, Lagos, Nigeria, 28-30 January 2014, pp. 201-219.



Minister of Science and Technology, Honourable Naledi Pandor visiting CUT - CRPM.

Smallwood JJ & Emuze FA. 2014. Financial provision for construction health and safety (H&S). In: Proceedings of the 2014 Construction Research Congress (CRC 2014), 19-21 May, Atlanta, United States of America, pp. 1881-1890, ISBN: 978-0-7844-1351-7.

Eromobor S, Das D, & Emuze FA. 2014. An explorative look at the challenges in the design of sustainable buildings with the aid of Building Information Modelling (BIM) in South Africa. In: Proceedings of the 2014 CIB-W107-Construction in Developing Countries International Conference, 9-11 February, Lagos, Nigeria, pp. 590-599.

Emuze FA & Crosbie VN. 2014. Lean from the contractor perspective: Wasteful tendering in Southern Africa. In: Proceedings of the 22nd Conference of the International Group for Lean Construction (IGLC), 24-27 June, Oslo, Norway, A3 Booklet for Posters, pp. 266-267.

Emuze FA & Ungerer HP. 2014. Change in South Africa construction: Lessons from lean thinking. In: Proceedings of the 22nd Conference of the International Group for Lean Construction (IGLC), 24-27 June, Oslo, Norway, pp. 1121-1131. ISBN: 978-82-321-0461-1.

Emuze FA & Ravu P. 2014. Exploring the impact of project scope on cost overrun: The case of an SOE in South Africa. In: Proceedings of the 30th Annual Association of Researchers in Construction Management (ARCOM) Conference, 2-4 September, Portsmouth, United Kingdom, 765-774. ISBN: 978-0-9552390-8-3.

Wentzel L, Wentzel T, Smallwood JJ & Emuze FA. 2014. The construction SMEs development debate in South Africa: Contributions from FET colleges. In: Proceedings of the 30th Annual Association of Researchers in Construction Management (ARCOM) Conference, 2-4 September, Portsmouth, United Kingdom, pp. 1463-1472. ISBN: 978-0-9552390-8-3.

Emuze FA, Smallwood JJ & Beetge W. 2014. Supply chain integration barriers in South African construction: Views from two projects. The Second Australasia and South-East Asia Structural Engineering and Construction Conference (ASEA-SEC-2), 3-7 November, Bangkok, Thailand.

Wentzel L, Smallwood JJ & Emuze FA. 2014. Marketing, tendering and estimating competencies of construction SMEs. In: Proceedings of the International Conference on Infrastructure Development and Investment Strategies for Africa, 25-26 September, Livingstone, Zambia.

- De Jager H & Emuze FA. 2014. Do statutory and professional bodies in South Africa threaten academic freedom at universities? A perspective from the engineering profession. In: AAEE2014 Conference, Wellington, New Zealand. ISBN: 978-0-473-30428-7.
- Das D & Sonar S. 2014. Reinventing the Indian cities through a culture of stakeholders participation in urban redevelopment and regeneration process, 62nd NTCP Congress Technical Report, Pune, India, pp. 219-228.
- Swart AJ & Sutherland T. 2014. Co-operative learning versus self-directed learning in engineering: Student preferences and implications. FIE2014, Frontiers in Education, IEEE. Madrid, Spain, Melia Castilla Hotel and Convention Center, 22-25 October.
- Kuriakose RB & Swart HJ. 2014. Using reflective practices to reduce dropout rates among first-year students at a university of technology: A South African perspective. FIE2014, Frontiers in Education, IEEE. Madrid, Spain, Melia Castilla Hotel and Convention Center, 22-25 October.
- Kuriakose RB & Vermaak AJ. 2014. Work-integrated learning at a university of technology: Assessment and management. FIE2014, Frontiers in Education, IEEE. Madrid, Spain, Melia Castilla Hotel and Convention Center, 22-25 October.
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REPORTS FROM RESEARCH PROFESSORS

Prof. I Yadroitsau was appointed Research Professor at the CUT from 1 January 2014. His background includes PhD and MSc degrees in Laser Physics and Optics along with 30 years of academic experience in Applied Optics and laser technologies (selective laser melting/sintering, laser cladding, interferometry and optical monitoring systems, material science). Prof. Yadroitsau



has a strong interdisciplinary background and broad experience in the field of Physics and Engineering which allows him to deeply comprehend scientific and technical problems with the purpose to find original solutions in different fields of laser applications. It should be specially mentioned that Prof. Yadroitsau can be credited with more than 120 scientific publications.

In 2014 Prof. Yadroitsau, in cooperation with researchers from South Africa, Brazil, Sweden, France and Russia, published three articles, attended four conference proceedings and filed a patent application for in-process monitoring of selective laser melting (SLM). This invention relates to a method and device for in-process monitoring, measurement and control of the geometric characteristics of 3-D objects produced by SLM. The proposed system will create real-time reports and a "passport of quality" of SLM manufactured objects with estimated porosity and location of probable defects. It also makes provision for a feedback controller to optimise the quality of manufactured products.

Prof. Yadroitsau participated in a number of scientific seminars in CSIR, Stellenbosch University, the University of Cape Town, the Vaal University of Technology as well as the Nelson Mandela Metropolitan University. These meetings were devoted to closer cooperation, the scientific challenges and the establishment of a national consortium for producing parts of titanium alloys by additive manufacturing (AM). He participated in collaboration with the three-year program "Qualification of Additive Manufacturing of Ti6Al4V for Medical Implants and Aerospace Components" which was granted by the DST.

In 2014 Prof. Yadroitsau's project titled "Upgrading of an EOSINT M250 additive manufacturing machine to a modern open laser system" was also granted by the National Laser Centre Rental Pool Program. The project has the following research aims:

- To conduct a series of new innovative research projects for further in-depth study of "laser irradiation-powder-substrate" systems for different types of powder material (metal, ceramic, composite, polymer)
- To develop new SLM software allowing one to carry out flexible control over the strategy of manufacturing objects
- To attract a significant number of postgraduate students from different departments, allowing them to gain new experiences and to expand their horizons in solving innovative problems.

Prof. Yadroitsau actively participates in the organisation of the new Metallographic Laboratory and the purchase of scientific equipment. He works daily with master's students to enhance their scientific knowledge and professional skills.

POSTDOCTORAL FELLOWSHIP

Dr Ina Yadroitsava is currently Postdoctoral Fellow in the Department of Mechanical and Mechatronic Engineering in the Faculty of Engineering and Information Technology at the CUT. Her research interests include physical aspects of laser-matter interaction, numerical simulation, and investigation of microstructure and mechanical properties of the



objects manufactured by selective laser melting (SLM), design of engineering experiments, quality and process-control as well as analysis of the physical properties of powders.

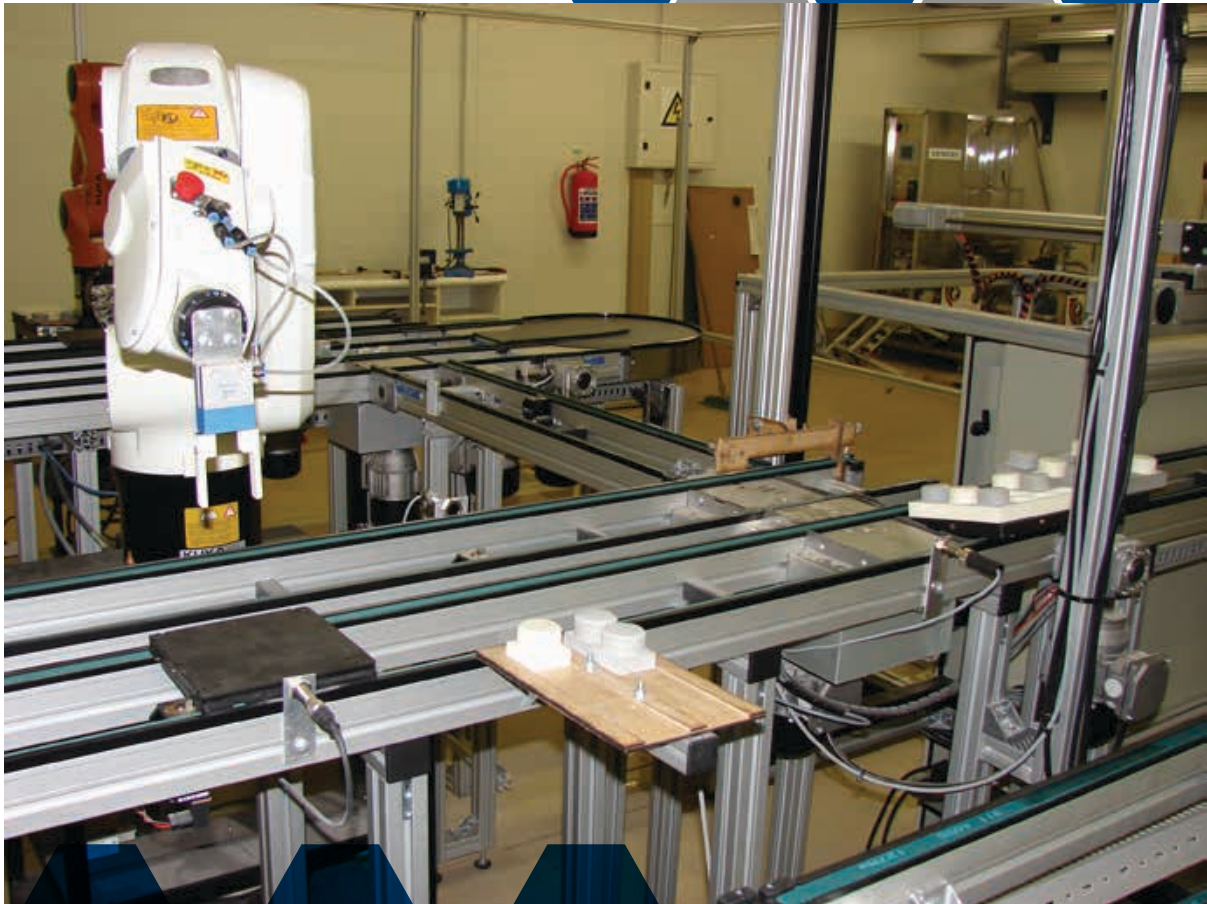
In 2014 Dr Yadroitsava, in cooperation with Profs. Yadroitsev and Krakhmalev (Sweden), published two articles on micro-structural evolution in Ti6Al4V alloy after SLM processing and design of the principles for high-quality objects produced by SLM. Strategy toward the manufacturing of fully dense parts from AISI 420 stainless steel by selective laser melting was reported at the RAPDASA 2014 Conference in November. The study was conducted in cooperation with French and Brazilian scientists. A paper titled "Peculiarities of single track formation from Ti6Al4V alloy at different laser power densities by SLM" (co-authored with Prof. I. Yadroitsev, J. Els and G. Booysen) was selected for a future special publication in the *South African Journal of Industrial Engineering*. Analysis of residual stress in SLM samples from stainless steels, their density and microstructure was published in proceedings of the 1st International Conference "Progress in Additive Manufacturing" (Singapore). As part of the staff development programme, a one-week study titled "XRD measurement of stress" was conducted. At the Department of Mechanical Engineering at Nelson Mandela Metropolitan University, the residual stresses in Ti6Al4V alloy for biomedical application were measured. An Abstract presented to the Light Metals Technology Conference, which will be held in 2015 in Port Elizabeth, was accepted.

Dr Yadroitsava participated in research seminars in CSIR, Stellenbosch University, the University of Cape Town, the Vaal University of Technology as well as the Nelson

Mandela Metropolitan University. These meetings were dedicated to creating the consortium of titanium alloys produced by additive manufacturing. She participated in collaboration with the three-year plan "Qualification of Additive Manufacturing of Ti6Al4V for Medical Implants and Aerospace Components" and which was granted. Dr. Yadroitsava was an active member of the DRC council. She was also a reviewer of the project Organisation for Scientific Research in the Netherlands.

Dr Yadroitsava was one of the internal examiners of CUT MEng students such as Johan Els, Ellen Ramosoou

and Joseph Nsengimana. She consulted students in powder characterisation, laser processing and peculiarities of additive manufacturing. With the active participation and funding from the University and the DST, a metallographic laboratory was equipped with a new mounting press and polishing machine for sample preparation. The upgrade and repair of existing equipment, such as a microscope and microhardness tester, was also done. Since 2015, master's students under the supervision of Dr Yadroitsava have learned the principles of the preparation of metallographic samples and the analysis of their microstructure and mechanical properties.



Faculty of Health and Environmental Sciences



Message from the Dean

Prof. S Mashele

The Faculty of Health and Environmental Sciences (FHES) research areas are exciting, but they only hint at what goes on behind the scenes. Thanks to the efforts of our talented staff and students, the FHES is a dynamic environment of innovation seeking to conquer the world. For the academic year 2014, the Faculty produced 22 research outputs in the form of accredited articles and presented 56 papers at national and international conferences. Nine master's and four doctorates were awarded. A new research centre was approved in 2014 in the Faculty as well as institutionally. The unit for

Applied Food Safety and Biotechnology became a fully-fledged centre, known as the Centre for Applied Food Safety and Biotechnology. The Department of Life Sciences established a new research unit, known as the Sustainable Bio-Environments Research Group.

The Centre and Unit will conduct research on food and associated disciplines as well as water and environment. The Department of Health Sciences established a Unit for Drug Discovery.



Message from the Research Manager

Dr N Malebo

The year 2014 saw phasing out of the old centralised approach to funding distribution and implementation of a faculty-centred approach to funding distribution. The Faculty of Health and Environmental Sciences would like to acknowledge Prof. JFR Lues who steered the ship after Prof. Shale stepped down as research manager.

Through the new funding system, students and staff members received funding under the following categories: master's and doctoral education programmes, next generation researchers, postdoc fellowship programme, emerging researcher programme, mid-career researcher programme, focused researchers career programme and established researcher programme.

The focused researcher's career programme is one of the new and exciting programmes that have

been established to support black female researchers within the Faculty; the Faculty is currently supporting two black female students currently undertaking their doctoral studies.

The year 2014 produced 22 research outputs in the form of accredited articles and presented 56 papers at national and international conferences for the Faculty. Moreover, nine master's and four doctorates were awarded.

The Unit of Food Safety and Biotechnology was given centre status and became the Centre for Applied Food Safety and Biotechnology.

The Department of Health Sciences established a Unit for Drug Discovery while the Department of Life Sciences established the Sustainable Bio-Environments Research Group.

“The focused researcher's career programme is one of the new and exciting programmes that have been established to support black female researchers within the Faculty

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DEPARTMENT OF AGRICULTURE

Animal Production and Optimisation

The research group for animal production and optimisation focuses on animal production, primarily in the Free State and Northern Cape areas. The head of the group is Prof. Pieter Fourie of the Department of Agricultural Management at the CUT. This group is currently one of the leading in South Africa specialising in the Dorper breed since 1999 and has published various publications in recent years, delivered presentations at local and international conferences as well as registered a patent. Research collaboration exists with institutions such as the UFS, US, ARC, NMMU, SA Studbook and the SA Dorper Breeder's association. Collaboration exists with authoritative academics in the field, including Prof. F Naser (UFS) and Prof. E du Toit. Close cooperation has also been forged with various livestock industries that generously provide animals for research studies. Outputs include publications by members of the group in popular and semi-scientific journals, accredited scientific journals and accredited conference contributions. Currently the group comprises two doctoral and five master's students; these include one student from the United States of America, Miss Tiffany Tierson, working on the conservation of lions in the Free State against the backdrop of the increasing illegal trade in lion bone. Other projects in the group includes profitability during the back-grounding of beef calves, the viability of Dorper sheep farming, optimising muscle-massage techniques for performance horses, sheep production in emerging small-scale farming systems and parasite control in broilers.

Assisted Animal Reproduction Technologies Research Group

The leader of this group is Prof. Dennis O. Umesiobi who is a NRF C-rated researcher and Professor of animal reproductive physiology. He is also HOD of the Department of Agriculture at the CUT. The research projects run in the group include innovative animal

reproduction technologies, genetic characterisation and enhanced reproduction in swine, sheep and chicken, sustainable animal production systems, mammalian multiple ovulation and embryo transfer technology, enzootic geophagia and zoological ecosystems and habituation. The group boasts six doctoral and ten master's students. Members of the group generate research outputs by means of peer-reviewed accredited journal contributions as well as presentations to international and local conferences. Collaborations exist with the majority of South African higher education institutions and colleges as well as the Agricultural Research Council Irene, Glen Agriculture College and SADC institutions including the University of Botswana in Gaborone and the University of Swaziland in Luyengo. Prof. Umesiobi also has ongoing international links with universities in Nigeria, the United States, Canada, the Netherlands, Australia and Japan.

Research in Crop Production Economics and Farm Management

Prof. C. van der Westhuizen is heading the group of researchers working in the field of Crop Production Economics and Farm Management. The rationale of this group is: (1) to learn more about farm management-related challenges and to develop solutions and best practices, (2) to find new scientific ways to consistently improve crop yield, (3) to determine the economic feasibility of research conducted and the financial advantage thereof to farmers, and (4) to assist new farmers to become independent and successful commercial farmers. Funding for the project was obtained from the NRF Research and Technology Fund with the short title of "Oxygen in growth medium". The project is a joint effort between the CUT, the UFS, an industrial partner (Caryki Consulting CC) and the Northern Cape Department of Agriculture, Rural Development and Land Reform. Three DTech and ten MTech students were part of this programme in 2014.



Prof. Pieter Fourie provided training in sheep dosing and husbandry to the young previously disadvantaged farmers at Luckhoff.



DEPARTMENT OF CLINICAL SCIENCES

Clinical and Biological Device Assessment

The research group is jointly headed by Dr Lizelle Botes and Prof. Elmien van den Heever and focuses on heart valve development and assessment as well as aspects of cardio-thoracic surgery. The impact of HIV/Aids, either separately or on cardiomyopathy and associated surgical outcomes, are also investigated. The group has intact collaborative agreements with the Department of Cardiothoracic Surgery at the UFS, led by Prof. Francis Smit. Currently the group boasts six master's and two doctoral students and receives external funding and support from the Free State Government, the Red Cross and the MRC. Research outputs are regularly produced by means of conference contributions locally and abroad, as well as publications in journals such as the *Journal of Heart Valve Development* and the *African Cardiovascular Journal*.

Research Group into Health Science Education

This group is headed by Prof. Hesta Friedrich-Nel and focuses on the educational constructs of health sciences, the latter including primarily Radiography, Emergency Medical Care, Somatology, Biomedical Technology and Clinical Technology and others. Although the research and disciplines investigated encompass the social and educational sciences, a number of faculty members have found a home under this group toward furthering their postgraduate careers. The group has strong ties with the UFS Department of Health Professions Education and the Faculty of Education at the UFS, and has a number of times hosted Prof. Joyce MacKinnon from IUPUI as Fulbright Scholar to the CUT. Other collaborations exist with Prof. Deborah Murdock-Eaton (Leeds, UK) and various members of the South African Association of Health Education. The research focuses on the contemporary modes of delivery and assessment required to ensure optimal skills development in the health field, boasts three doctoral and two master's students and often publishes in the *South African Journal of Higher Education* and the *African Journal of Health Professions Education*.

DEPARTMENT OF HEALTH SCIENCE

Unit for drug discovery: The unit currently has two subgroups, namely phytomedicine and Bioinformatics.

The **phytomedicine** research group is led by Prof. S Mashele and managed by Dr IT Manduna. The group specialises in ethno-pharmacology with special emphasis on medicinal plants. Current projects involve the scientific validation of the use of plant medicines by traditional healers through a number of screening tests for antimicrobial, anti-diabetic, anticancer, anti-inflammatory and antioxidant activity. The chemical profiling of medicinal plants is also carried out. These projects are aimed at contributing to the development of novel drugs or drug leads as well as the documentation of indigenous knowledge in partnership with the Kopano Dingaka Association (Traditional Healers of Thaba 'Nchu). The group has established national collaboration with scientists from the CSIR, MRC, Stellenbosch University as well as the University of the Free State. International collaborations include the NRF funded bilateral

project with the Universidade Eduardo Mondlane of Mozambique. The phytomedicine research group has one doctoral candidate (who graduated in 2014) and six master's students who will graduate in 2015. Numerous journal articles were published in 2014 and research results have been presented at various national and international conferences.

Bioinformatics Cytochrome P450 monooxygenases: From basics to evolution and novel drug targets to biotechnological tools

Recent advances in genome sequencing of organisms have changed the way in which research is carried out. Nowadays, before researchers proceed to wet laboratory experiments, a great amount of information can be obtained by bioinformatics analysis of organisms' genomic data. Dr Syed's group at the CUT uses such tools to understand cytochrome P450 monooxygenase (P450s) heme-thiolate proteins that are ubiquitously distributed in organisms across the biological kingdoms. The group's research is focused on P450-based drug-designing against human pathogens, development of P450 enzyme-based novel tools for bio-remediation of cancer-causing and endocrine-disrupting chemicals and evolutionary analysis of P450s through genome data mining. Research specifics include (i) unravelling the role of orphan P450 enzymes in microbial physiology, (ii) structure-activity relationship of P450 enzymes, (iii) P450 enzyme-based rational drug-designing, (iv) protein engineering, and (v) genome-wide P450 annotation and phylogenetic analysis.

Main research findings:

(i) For the first time in 55 years of P450 research, the group reported the identification of amino acid patterns based on EXXR and CXG motifs that are characteristic of the P450 family; (ii) for the first time the group reported a large number of thermostable P450s from eukaryotic organisms such as thermophilic biomass-degrading fungi *Myceliophthora thermophila* and *Thielavia terrestris*; (iii) the group identified that CYP53 can serve as a common alternative drug target against pathogenic fungi. The particular study was also the first report on genome-wide comparative structural (gene and protein structure-level) and evolutionary analysis of a fungal P450 family; (iv) for the first time the group identified and performed comparative-evolutionary analysis of P450 families enriched in model basidiomycetes; (v) Dr Syed's group also performed genome-wide annotation, identification and phylogenetic analysis of P450s in *Saccharomycotina*, fungal subphyla that contain biotechnologically important and opportunistic human pathogen yeasts. They identified a novel P450 family in *Pichia pastoris* and *Dekkera bruxellensis*.

This study was conducted by Ms Kgosiemang, a BTech student, and published in an accredited international journal.

Group members: In 2014, six students completed their BTech research projects in Dr Syed's group. Currently, quite a number of students are part of this group, working towards their DTech (two) and MTech (six) degrees and BTech project work (eight).

Sustainable Bio-Environments Research Group

The Sustainable Bio-Environments Research Group comprises three subgroups into *water, forestry and waste management*. The *Water Quality Research Group* operates under the leadership of Prof. Annabel Fossey and focuses on assessing the quality of water in greater Mangaung, Free State Province. Projects include researching the quality of water in rural towns, groundwater and water used in African funeral rituals.

During 2013, the research focus was broadened to also include studying the ecological quality of streams.

The subgroup boasts one doctoral student and six master's students, of which three master's students graduated in 2013 – one with a cum laude. This research is funded by the NRF and Mutual and Federal. The *Forestry Research Group*, also lead by Prof. Fossey, specialises in rooting enhancement strategies tested for commercially important *Eucalyptus* hybrids and species.

Collaborators in this research are the Institute for Commercial Forestry Research and a commercial forestry nursery, Sunshine Seedling Services. This research is funded by the NRF.

One student completed her master's studies in 2013 and the remainder of the group comprises three doctoral and eight master's students. A third subgroup focuses on *waste management* and is headed by Dr Hester Roberts, boasting three doctoral and six master's students. This group focuses primarily on optimisation strategies for landfill sites as well and novel solid, liquid and hazardous waste technologies.

The Centre for Applied Food Safety and Biotechnology

The Centre for Applied Food Safety and Biotechnology has existed since 1995 as part of the then Activity Programme of the National Research Foundation.

The main aim of the unit is to perform cutting-edge food safety and microbiology research and the group is currently one of the most comprehensive in South Africa focusing exclusively on aspects of food safety and hygiene. The unit carries the status of Developed Niche Area at the NRF and currently boasts a critical mass of about 32 members, including 11 master's and eight doctorates, one postdoc, three full-time researchers, three external grant holders and one administrative assistant.

The leader of the group, Prof. JFR Lues, is an NRF-rated researcher. In 2013, Prof. Lues was elected vice-president of the South African Association of Food Science and Technology. Successes of the Unit include producing the first black doctorate graduates (male and female) at the CUT, the first Indian doctorate graduate (female) and the first black male and female NRF grant holders at the CUT. To date the unit has accommodated seven postdoctoral fellows of whom four advanced to fixed-term positions.

Members of the unit continuously review and assess external contributions to scientific journals, master's and doctorate theses, funding and rating applications while members serve on the editorial panels of authoritative journals such as the *Journal of Food Protection* and the *British Food Journal*. Since 2005, a number of visiting professors have visited the centre whereas the group regularly sends members and students to local and overseas conferences and on study visits (delegates have in recent years attended conferences and conducted study visits across the United States, Greece, Italy, Hungary, New Zealand, Brazil, Canada and the United Kingdom). Local



CUT, Angola and Mozambique Collaboration. From left to right: Dr. I Manduna, Mr A Ngombo (Angola), Prof. L Lategan, Prof. S Mashele, Dr N Malebo, Dr M Bengui (Angola), Mr M Nxumalo (NRF), Dr D Ncango (ARC). Seated: Prof. T Msagati (UNISA), Mr R Chitondo (Mozambique).

conferences where papers are read on an annual and biannual basis include, amongst others, SASM (SA Society for Microbiology), SAAFoST (SA Association for Food Science and Technology), Bio2Biz (SA Biotechnology Conference), SASDT (SA Society of Dairy Technology), SAIEH (SA Association of Environmental Health) and FIDSSA (Federation of Infectious Diseases of South Africa).

The majority of members of the centre are either student or professional members of these associations. International associations where members are affiliated and that are visited during annual events include the ICFMH (International Committee on Food Microbiology and Hygiene) and IAFP (International Association of Food Protection). Selected individuals also hold membership with the IAFP, ICFMH and SFAM (Society for Applied Microbiology) and serves on various working groups. To date, five members of the unit have received VC's medals for best researchers as well as best postgraduate student at the institution and various other in-house accolades.

The research carried out in the Centre is categorised under the following subgroups: (1) Bioactive oils, (2) Antimicrobial tolerance and adaptation, (3) Food effluent characterisation, (4) Food-related biofilms, (5) Food safety assessment in health care and traditional environments, (6) Food-related bioaerosols, (7) Maize biotechnology and safety, and (8) food handler and consumer behaviour in formal and informal settings. For its exclusive use the Centre boasts fully equipped laboratories with contemporary analytical equipment such as HPLCs, capillary electrophoresis systems, GCs and a GC-MS, an electron microscope and state-of-the-art molecular apparatus. Generous funding in the form of internal and external sources is available to conduct projects and supports current and prospective postgraduate students.

Subgroup food safety assessment and infection control: Jane Nkhebenyane is the group leader and the main research focus is the assessment of food handling behaviours including the evaluation of food safety interventions, hygiene promotion and food safety training in compromised environments. Antimicrobial profiling and molecular characterisation of food-borne pathogens in vulnerable health care settings are also part of the group's activities. The work of the group contributes to the development of health interventions and their evaluation, and situational analyses in social and economic contexts through the use of qualitative empirical research.

The group currently has one doctoral, one master's and two fourth-year students with Prof. Oriel Thekiso (North-West University) as a participating member. The group also collaborates with the London School of Hygiene and Tropical Medicine in the United Kingdom. Research articles that emanated from the research work of the group are regularly published in reputable journals and members present papers at international and national conferences; these include recent visits to the United States, Canada and Switzerland. Application for funding has been submitted to the NRF and the group enjoys financial support from the MRC and SANPAD.

Dr Ntsoaki Malebo's subgroup specialises in the search for bioactive oils against food-borne spoilage and pathogenic microorganisms. Currently this group is using various techniques such as electron micro-

scopy and mass spectrometry-based proteomics to elucidate the mode of action of bioactive oils against these microbes. The main aim is to find alternative antimicrobials that will serve as natural bio-preservatives and disinfectants to replace currently used synthetic antimicrobials.

The research links with research conducted by another member of our Faculty, Dr Moosa Sedibe, into aromatic oils found in *Rose geranium* and other plant species.

Apart from its internal linkages, the projects are conducted in collaboration with the Institute for Tropical and Sub-tropical crops at the Agricultural Research Council and the University of Johannesburg.

Dr Malebo is currently an NRF-CUT Research Fellow who supervises three master's and one doctoral student. She has successfully supervised two master's students who have since graduated. Dr Malebo is jointly responsible for setting up a microscopy unit that will boast a scanning, AZ100 zoom electron microscope and a fluorescence microscope.

Together with her group, they have published papers in international peer-reviewed journals and presented papers at national and international conferences such as the HOPE Meeting attended by a number of Nobel Laureates.

Food industry-related effluent characterisation subgroup: This effluent research team, headed by Dr Olga de Smidt, focuses on applying micro- and molecular diversity analyses as a tool to establish multifaceted fingerprints for food industry wastewater contributors as an instrument for microbial source tracking.

Current projects aim to assess the current status of wastewater monitoring and treatment in the towns/cities in the Free State with food production, processing or packaging factories. This is achieved by constructing, analysing and assembling microbial fingerprints for, amongst others, abattoirs, fruit juice bottling factories and dairies. In cases where optimal methodologies do not yet exist, various projects in the group focus on finding methodologies to assemble microbial diversity profiles for food industry effluents.

Ultimately the activities endeavour to introduce bio-treatment options in attempts to remediate effluents and contribute to general environmental sustainability of the food industry.

The team collaborates with the University and the Free State in terms of Sanger Sequencing, Stellenbosch University for Next Generation Sequencing and the University of Ljubljana for skills development and student exchange. The subgroup boasts six master's students, three doctoral students and five graduate student assistants.

The group was initiated in 2012 and is currently funded by the National Research Foundation (NRF) under the Thuthuka programme. The team regularly publishes in foremost journals, whereas members regularly attend conferences locally and abroad – usually the group sends notable delegations abroad to the International Committee of Food Microbiology and Hygiene.

Other research foci in the Centre include maize biotechnology and fermentation (Dr Hanita Swanepoel), entrepreneurial education (Miss Elvina Smith) and Mr Roan Slabbert (antimicrobial adaptation).

FOSTERING STRATEGIC PARTNERSHIPS

The following research partnerships were fostered:

Institution	Nature of partnership	Activities in 2014
Hanze University of Applied Sciences, Groningen, Netherlands	International collaboration: student academic exchange programme	Seven students from Hanze University (The Netherlands) were placed in the diagnostic and therapy practices for 20 weeks until the end of June 2014. From September, five students from Hanze University were placed in the diagnostic and therapy practices until February 2015.
University of Kimpa Vita, Angola	African partnership	Workshop on Science and Technology from 24-28 June 2014. Four staff members from the CUT made presentations at this workshop in Uige, Angola.
University of Eduardo Mondlane, Mozambique	African partnership	Exchange of plant material between the CUT and the Eduardo Mondlane University for analysis at the CUT.
University of Wisconsin-Madison, USA; Agricultural University, China; University of Alberta, Canada	International collaborations	Dr Syed established research collaboration with high-profile researchers from various countries, including the United States of America, Canada, Europe (Slovenia, Poland and Germany), Japan, India, South Korea and China.
University of New England, Australia; University of Manitoba, Canada, and Cornell University, USA	International collaborations	Prof. DO Umesiobi holds ongoing cooperation with various international universities.

Completed Master's Degrees

Kumalo MP. 2014. *Characterization of sheep and goat production systems amongst small-scale farmers in the Southern Free State*. Central University of Technology, Free State.

Matli KP. 2014. *An investigation into factors affecting profitability in the back-grounding of beef calves*. Central University of Technology, Free State.

Khetsha ZP. 2014. *The effect of potassium and water quality on the yield and oil quality of rose geranium (P. graveolens L.)*. Central University of Technology, Free State.

Patrick MA. 2014. *Characterization of rhizobacteria communities of Eucalyptus species and hybrids*. Central University of Technology, Free State.

Raphuthing MV. 2014. *Association between geophagia and haematological parameters of iron deficiency anaemia amongst geophagic QwaQwa women*. Central University of Technology, Free State.

Kander V. 2014. *A validation of a paediatric guideline on basic electroencephalogram interpretation for clinicians*. Central University of Technology, Free State.

Crous A. 2014. *An evaluation and comparison of metabolic and clinical changes in patients with acute coronary syndromes undergoing on-pump and off-pump coronary artery bypass surgery*. Central University of Technology, Free State.

Shilenge LB. 2014. *Microbial hazards associated with meat processing in butcheries within Mangaung Metropolitan Municipality*. Central University of Technology, Free State.

Nhlapo N. 2014. *Hygiene and nutritional content associated with the National School Nutrition*

Programme in Bloemfontein, South Africa. Central University of Technology, Free State.

Completed Doctoral Degrees

Vermaak E. 2014. *The influence of a nutritional supplement on lung function and immune status of HIV-positive patients in the Mangaung Metropolitan*. Central University of Technology, Free State.

Clark CL. 2014. *An investigation into the quality of life of chronic haemodialysis patients managed with outcome-driven protocols in South Africa*. Central University of Technology, Free State.

Raphela SF. 2014. *Occupational exposure to electromagnetic fields in the heavy engineering CO₂ welding industry in the Mangaung Metropolitan Municipality*. Central University of Technology, Free State.

Fuku SL. 2014. *An investigation of the phytochemistry and biological activity of Asparagus larinicus*. Central University of Technology, Free State.

List of Conference Posters

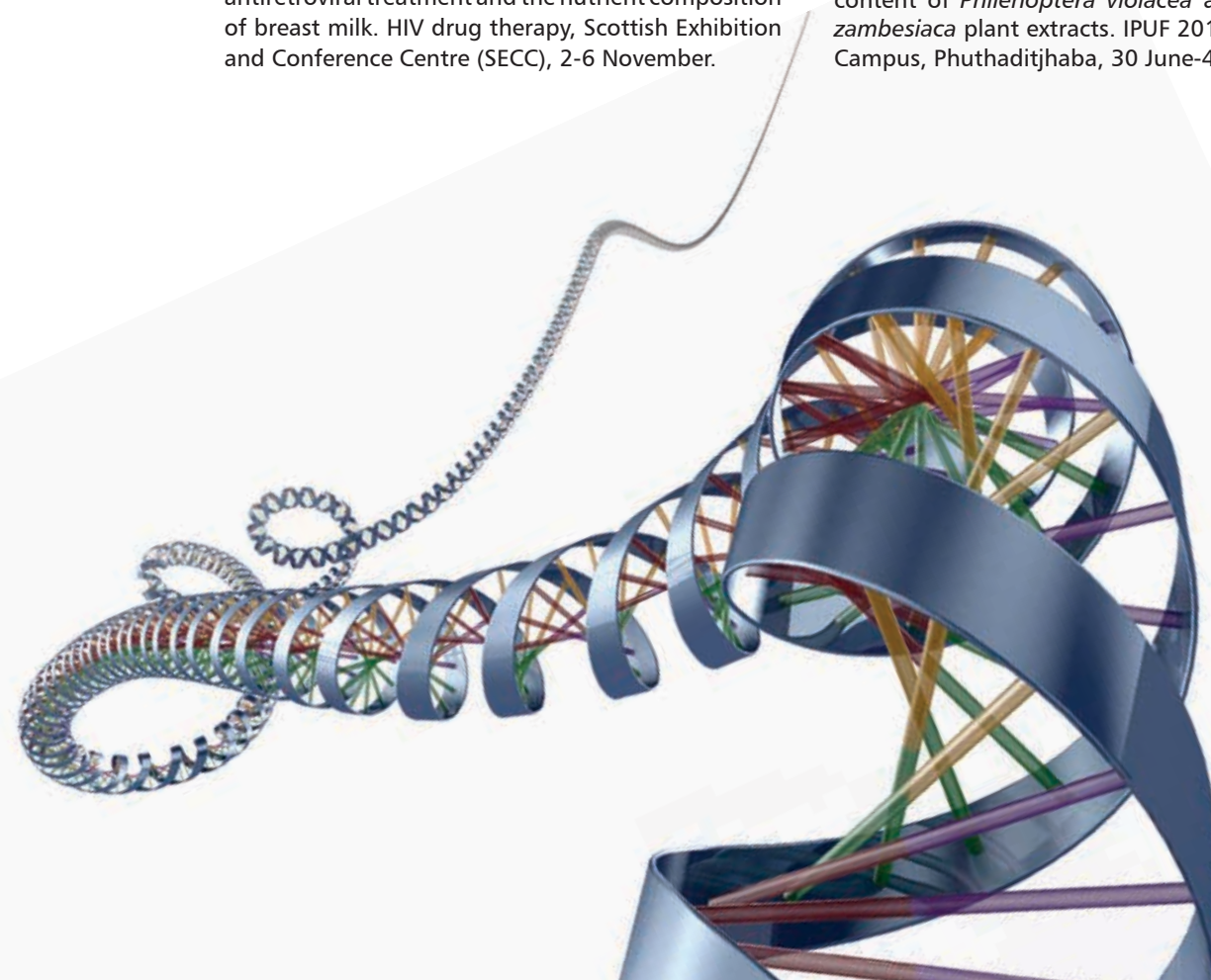
Raphela SF. 2014. Possible health symptoms associated with electromagnetic field exposure in the welding industry. 42nd Conference of the Physiology Society of South Africa, Gateway Hotel, Durban, University of KwaZulu-Natal, 14-17 September.

Ntsoelinyane PH, Mashele SS & Manduna IT. 2014. Antioxidant activity of *Philenoptera violacea* and *xanthocercis zambesiaca* plant extract. 2nd International Conference and Exhibition on Pharmacognosy, Phytochemistry, and Natural Products, Beijing, China, 25-27 August.

- Fourie PJ & Van Rooyen IM. 2014. The effect of pelvic size on lambing ease in young Dorper ewes: Preliminary results. Dorper World Conference. Bredasdorp, 16 September.
- Fourie PJ & Matli KP. 2014. Factors affecting profitability in the backgrounding of beef calves: A South African perspective. 65th Annual Meeting of the European Federation of Animal Production, Copenhagen, Denmark, 25-29 August.
- Van Rooyen IM & Fourie PJ. 2014. Prediction of pelvic area through body measurements in Dorper ewes. 65th Annual Meeting of the European Federation of Animal Production, Copenhagen, Denmark, 25-29 August.
- Van Rooyen IM & Fourie PJ. 2014. Prediction of pelvic area through body measurements in Dorper ewes. Dorper World Conference, Bredasdorp, 16 September.
- Umesiobi DO. 2014. Reciprocity of bio-stimulation on testicular traits and subsequent fertility of South African Mukota sows. World Congress of Reproductive Biology 2014, the Edinburgh International Conference Centre (EICC), Edinburgh, Scotland, 2-4 September.
- Mugomeri, Olivier & Van den Heever-Kriek. 2014. The effect of Tenofovir in Renal function in HIV-positive adult patients in the Roma Health Service area, Lesotho, Southern Africa. HIV drug therapy, Scottish Exhibition and Conference Centre (SECC), 2-6 November.
- Van den Heever, De Wet & Hattingh. 2014. Possible association between the stage of HIV disease, antiretroviral treatment and the nutrient composition of breast milk. HIV drug therapy, Scottish Exhibition and Conference Centre (SECC), 2-6 November.
- Malebo NJ & Setlhare GG. 2014. Heating ventilation and air conditioning systems are possible sources of indoor air fungi in health care environments. 26th Annual International Society for Environmental Epidemiology 2014, Seattle, Washington, USA.
- Swanepoel H, Venter P & Lues JFR. 2014. Triglyceride profiles in juvenile SA Cape Hake (*Merluccius capensis* and *Merluccius paradoxus*) muscle tissue. International Conference IUFOST (International Union of Food Science and Technology) 2014, Montréal, Canada.
- De Smidt O & Moletsane MA. 2014. Molecular fingerprinting of abattoir effluent: Suitable extraction methods for isolating DNA from different sources. 24th International ICFMH FoodMicro Conference: Nantes, France, 1-4 September.
- Theisinger SM & De Smidt O. 2014. Bioaerosol composition at a fruit beverage bottling facility. 24th International ICFMH FoodMicro Conference: Nantes, France, 1-4 September.

List of Conference Papers

- Botha R, Bezuidenhout J & Nel MM. 2014. Radiography service-learning: Student experiences in relation to reciprocity, personal growth and the development of critical thinking skills. 18th ISRR World Congress, 13-15 June 2014, Helsinki, Finland.
- Ntsoelinyane PH, Friedrich-Nel H, Slabbert R & Von Gericke I. 2014. The 'X' Factor in ECP academic success: 2013 student perspectives. SAAHE 26-28 June, Cape Town, South Africa.
- Ntsoelinyane PH, Mashele SS & Manduna IT. 2014. Determination of Phytochemical and phenolic content of *Philenoptera violacea* and *Xanthocercis zambesiaca* plant extracts. IPUF 2014, UFS QwaQwa Campus, Phuthaditjhaba, 30 June-4 July.





Du Plessis J & Bezuidenhout J. 2014. A work-integrated learning education and training programme for radiography in South Africa. 18th ISRR World Congress, 13-15 June, Helsinki, Finland.

Friedrich-Nel H. 2014. The good, bad and ugly of an abstract. 18th ISRR World Congress, 13-15 June, Helsinki, Finland.

Muller H, Rae WID, Herbst C & Friedrich-Nel H. 2014. Interventional radiology dose distributions for vascular procedures undertaken at Universitas Hospital. 18th ISRR World Congress, 13-15 June, Helsinki, Finland.

Van der Merwe B, Kruger S & Nel MM. 2014. Standardised training and assessment in radiation safety for diagnostic radiographers. 18th ISRR World Congress, 13-15 June, Helsinki, Finland.

Mogongoa LF. 2014. Job shadowing for prospective students as per HPCSA requirement. Academic morning 15 March 2014, Society of Medical Laboratory Technologists of South Africa – Free State Branch, University of the Free State, Bloemfontein.

Smit FE, Botes L & Bester D. Mitral valvotomy: What do we know? Mitral Valve Surgery. CardioAlex 2014, All Africa in One Event Congress, Alexandra, Egypt, June 2014.

Smit FE, Bester D, V/d Heever JJ, Botes L & Dohmen PM. Biological Scaffold (Re-)sources. European Association for Cardiothoracic Surgery, Milan, Italy, October 2014.

Corbett KM, De Smidt O & Lues JFR. Yeast diversity in a typical fruit juice bottling plant. 24th International ICFMH FoodMicro Conference, Nantes, France 1-4 September 2014.

Chipfupa L, Nherera FV & Fourie PJ. 2014. Rangeland degradation in Opuntia-invaded dry zones of South Africa: Implications on grazing strategies, carbon sequestration and livestock outputs. Global Change Conference. Nelson Mandela Metropolitan University, 1-5 December. Oral presentation.

List of Journals/Articles (DHET subsidised)

Pieterse T, Lawrence H & Friedrich-Nel H. 2014. Problem-solving abilities of radiography students at a South African university. *African Journal for Health Professions Education*, May 2014, Vol. 6, No. 1, pp. 33-36.

Friedrich-Nel H & MacKinnon J. 2014. Formative postgraduate assessment: A comparative case study using a university in the USA and one in South Africa. *Innovations in Education and Teaching International* (Online) at <http://www.tandfonline.com/doi/full/10.1080/14703297.2014.981834>.

Jawallapersand P, Mashele SS, Kovačič L, Stojan J, Komel R, Pakala SB, Kraševac N & Syed K. 2014. Cytochrome P450 Monooxygenase CYP53 Family in Fungi: Comparative structural and evolutionary analysis and its role as a common alternative antifungal drug target. *PLoS ONE* 9(9): e107209. doi:10.1371/journal.pone.0107209.

Ntsoelinyane PH & Mashele SS. 2013. Phytochemical screening, antibacterial and antioxidant activities of *Asparagus laricus* leaf and stem extracts, *Journal of Pharmacology*.

Slabbert RS & Friedrich-Nel H. 2014. Extended curriculum evolution: A road map to academic success? *South African Journal of Higher Education*, Vol. 29, No. 1 9(1), pp. 10-14.

- Sedibe MM & Allenmann J. 2014. Effects of shading and moisture stress on yield and oil quality of hydroponically grown rose geranium. *Act Hort.* (SHS) 1023:249-254. (Publication.)
- Foster LA, Fourie PJ & Naser FWC. 2014. The profitability and production of a beef herd on transitional Cymbopogon – Themeda veld receiving three different levels of lick supplementation: Preliminary results. *South African Journal of Animal Science*. Vol. 44, No. 5, pp. 31-35.
- Syed K, Shale K, Pagadala NS & Tuszyński J. 2014. Systematic identification and evolutionary analysis of catalytically versatile cytochrome P450 monooxygenase families enriched in model Basidiomycete fungi. *PLoS ONE* 9(1): e86683. doi:10.1371/journal.pone.0086683. (Impact Factor 3.7).
- Syed K, Shale K, Nazir KHMNH, Krasevec Nada, Mashele SS & Pagadala NS. 2014. Genome-wide identification, annotation and characterization of novel thermostable cytochrome P450 monooxygenases from the thermophilic biomass-degrading fungi *Thielavia terrestris* and *Myceliophthora thermophila*. *Genes & Genomics* DOI: 10.1007/s13258-013-0170-9. (Most downloaded article.)
- Syed K & Mashele SS. 2014. Comparative analysis of P450 signature motifs EXXR and CXG in the large and diverse kingdom of fungi: Identification of evolutionary conserved amino acid combinations characteristic of P450 family. *PLoS ONE* Article number: PONE-D-14-03707. (Impact factor 3.7). (Accepted for publication with minor revision.)
- Jawallapersand P, Mashele SS, Kovac̃ić L, Stojan J, Komel R et al. 2014. Cytochrome P450 monooxygenase CYP53 Family in fungi: Comparative structural and evolutionary analysis and its role as a common alternative anti-fungal drug target. *PLoS ONE* 9(9): e107209. doi:10.1371/journal.pone.0107209.
- Mugomeri E, Olivier D & Van den Heever WMJ. 2014. The effect of Tenofovir on renal function in HIV-positive patients in Lesotho. *Medical Technology SA*, Vol. 28 (1).
- Smit FE, Bester D, Van den Heever JJ, Schlegel F, Botes L & Dohmen PM. Does prolonged post-mortem cold ischemic harvesting time influence cryopreserved pulmonary homograft tissue integrity? *Journal Cell and Tissue Banking*. (Accepted December 2014.)
- Kgosiemang IKR, Mashele SS & Syed K. 2014. Comparative genomics and evolutionary analysis of cytochrome P450 monooxygenases in fungal subphylum *Saccharomycotina*. *Journal of Pure and Applied Microbiology*, 8 (Spl. Edn. 2), pp. 291-302.
- Berggoetz M, Schmid M, Ston D, Wyss V, Chevillon C, Pretorius AM & Gern L. 2014. Tick-borne pathogens in the blood of wild and domestic ungulates in South Africa: Interplay of game and livestock. *Ticks and Tick-borne Diseases*, 2014 (5), pp. 166-175.
- Berggoetz M, Schmid M, Ston D, Wyss V, Chevillon C, Pretorius AM & Gern L. 2014. Protozoan and bacterial pathogens in tick salivary glands in wild and domestic animal environments in South Africa. *Ticks and Tick-borne Diseases*, 2014 (5), pp. 176-185.
- Mogotsi L, De Smidt O, Venter P & Groenewald W. 2014. Influence of sanitizers on the lipopolysaccharide toxicity of *Escherichia coli* strains cultivated in the presence of *Zygosaccharomyces bailii*. *Scientific World Journal*, Article ID 135856 (<http://dx.doi.org/10.1155/2014/135856>).
- De Smidt O, Smit NJ & Botes E. 2014. Bacterial diversity in soil from geophagic mining sites in the QwaQwa region of South Africa. *International Journal of Environmental Health Research*. <http://dx.doi.org/10.1080/09603123.2014.915019>.
- Oosthuysen J, Potgieter E & Fossey A. 2014. Compliance with infection prevention and control in oral health-care facilities: A global perspective. *International Dental Journal*, DOI: 10.1111/idj.12134.
- Nhlapo N, Kativu E, Lues JFR & Groenewald WH. 2014. Assessing the quality of food served under a South African school feeding scheme: A nutritional analysis. *South African Journal of Science*. (In Press.)
- Nhlapo N, Lues JFR & Groenewald WH. 2014. Microbial counts of food contact surfaces at schools depending on a feeding scheme. *South African Journal of Science*, 110: Art. #2013-035.
- Setlhare GG, Malebo NJ, Shale K & Lues JFR. 2014. Identification of airborne microbiota in selected areas in a health care setting in South Africa. *BMC Microbiology*, 14:100.
- Van Tonder NCP, Van der Westhuizen C & Van der Westhuizen RJ. 2014. Interaction effects of effective microorganisms and prolonged storage on germination and seedling vigour of maize, sorghum and sunflower. *Journal for New Generation Sciences*. Vol. 12 (1), pp. 147-161.
- Achilonu MC & Umesiobi DO. 2014. Bioactive phytochemicals: 1. Bioactivity, sources, preparations and/or modifications via silver tetrafluoroborate mediation. *Journal of Chemistry* – 629085. (Accepted.)

Patents

- Fourie PJ & Van Rooyen IM 2014. Pelvic meter. South Africa, Patent P59736ZP00, filed 11 December 2012, and issued February 2014.

List of Journals/Articles (not DHET subsidised)

- Fourie PJ & Van Rooyen IM. 2014. The relationship between pelvic measurements and lambing ease in young Dorper ewes: Preliminary results. *Dorper News* 2014.
- De Smidt O, Smit NJ & Botes E. *Bacterial diversity in soil from geophagic mining sites in the QwaQwa region of South Africa* was featured in the Public Understanding of Biotechnology.

Faculty of Humanities



A message from the Dean

Prof. D Ngidi

It is my privilege, as Dean of the Faculty of Humanities, to write this message on the Faculty's 2014 Annual Research Report. First and foremost, I would like to thank all members of staff who contributed towards the research achievements in 2014.

The Faculty produced 39.0 accredited publication credit units, 13.0 credit units above the 26.0 Faculty Annual Target. This is 72% of accredited articles (credit units) versus permanent staff (excluding staff involved with postgraduate studies and junior lecturers). However, 21.0 of the 39.0 credit units were published in the *Mediterranean Journal of Social Sciences* which has been delisted

by DHET from its list of accredited journals. The Faculty staff attended and presented 15 papers at national conferences and 11 papers at international conferences. This is a 26% conference attendance compared to the research outputs. The Faculty further produced ten master's students, meeting its annual target of ten students. It also produced six doctoral students, exceeding its annual target of three students.

The Faculty managed to raise R331 450.00 External Researchers Grant, R181 450.00 more than the R150 000 annual target. The Dean of the Faculty, Prof. DP Ngidi, achieved a Category C-rated Researcher rating from NRF (effective from 1 January 2014 to 31 December 2019).



A message from the Research Manager

Dr. MK Mhlolo

As the Faculty of Humanities Research Manager, it is my singular honour to present the 2014 Research and Development Report. In the previous year's report, the Dean's message highlighted the loss we suffered as a Faculty after the passing on of our highly productive colleagues, namely Research Professor Shumba and Dr Litheko. In 2014 fate was on our side and Asst. Prof. Alexander joined the Faculty from the University of the Free State. I make special mention of his joining the Faculty because he has made significant contributions in terms of spearheading collaborative research activities with Asian universities. Prior to his arrival, we had collaboration activities only in the Departments of Communication Sciences and Design and Studio Art, but after his arrival these activities have been extended to the other departments as well. At the time of writing this

report, we are awaiting the finalisation of three potential MOUs to be signed between the Faculty and three universities in Thailand as a result of Prof. Alexander's involvement. One of these MOUs is specifically biased towards STEM following significant contributions made by one of our potential collaborators towards improving the teaching and learning of Mathematics in Thailand.

As a faculty we feel such international collaboration will go a long way in enhancing the scholarly work of our researchers and this is consistent with the university's broad objective in terms of research and development. Besides this international focus, some of the Faculty's research and development efforts were directed at the support of the following activities.

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We are awaiting the finalisation of three potential MOUs to be signed between the Faculty and three universities in Thailand as a result of Prof. Alexander's involvement

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DEVELOPMENT OF RESEARCH AND SUPERVISION SKILLS

Rationale

Development of research, supervision and writing skills of staff and students is one of the critical objectives of the University. In pursuance of that objective, we held a number of workshops:

Annual Prestige Research Seminar

Our Annual Prestige Research Seminar was held on 25 November 2014. The Annual Prestige Research Day aims to encourage and foster efforts of staff, postgraduate students and academics by sharing their research experiences, innovations, models, theories and strategies that address issues and challenges related to research in the Humanities.

This year we received ten quality abstracts on a variety of very pertinent and enriching topics in research and these kept us busy way beyond the 1300 hours that we had scheduled to end the seminar. Given the two distinct groups of presenters (staff and students), it was agreed that there would be two categories of prizes as follows: (a) a prize for the best presentation under the experienced researchers' category, and (b) two prizes for the best and second best presentations under the novice researchers' category.

Support for Post-graduate Students and Novice Supervisors in Science, Technology, Engineering & Mathematics (STEM)

As a university of technology, the CUT has a particular focus and bias towards STEM and our faculty attempts to contribute towards this objective. Consistent with that vision, from 23 to 26 June 2014, the Faculty of Humanities successfully hosted the 12th Annual Southern African Association of Research in Mathematics Science and Technology Education (SAARMSTE) Research School at Maselspoort Resort and Conference Centre.

This is a regional (almost international) annual event targeting participants from the SADC region. The purpose of the Research Schools is to provide approximately 40 to 50 PhD participants (supervisors and students) with the opportunity for students to "show case" their work for comment and engagement in an open atmosphere, facilitate their research writing and publication skills and to explore various aspects of the research process in a supportive environment. To that effect the research school brings together supervisors to facilitate the provision of high-quality supervision and mentoring in postgraduate research programmes. That way the research school supports both the supervisors and the supervisees. The primary objective is to facilitate the progress of doctoral/postdoctoral students engaged in current research in Science, Technology, Engineering and Mathematics with the aim of producing people with the knowledge and skills that will enable southern Africa to engage proactively in a competitive global economy. As a faculty we were able to send the following participants to the SAARMSTE Research School 2014 held at Maselspoort Resort.

Supervisors: (1) Dr B Khoboli, (2) Dr MP Rankhumise, and (3) Dr MK Mhlolo

Students: Mr W Manduna and Mr I Phage

WRITING FOR PUBLICATION WORKSHOP

Rationale

The development of academic writing skills for staff and students remains a priority in the Faculty of Humanities. Our strategies for achieving this objective include seminars, workshops and personal interaction. In pursuance of this objective, this year we once more hosted Prof. Elias Mpofu from the University of Sydney in Australia from 27 to 28 November 2014.

The Faculty of Humanities has now established what I might describe as a more permanent relationship with Prof. Mpofu who is a full professor at the University of Sydney in Australia. Prof. Mpofu is Editor in Chief of the *Australian Journal of Rehabilitation Counselling* and the *Journal of Psychology in Africa*. He also serves on the editorial boards of several rehabilitation counselling-related journals, including the *Journal of Rehabilitation Administration*, *Rehabilitation Education*, *Rehabilitation Counselling Bulletin*, *Psychological Assessment*, and the *International Journal of Disability, Development and Education*. The *Journal of Psychology in Africa* (JPA) is accredited by the DHET. For the past three consecutive years, Prof. Mpofu has been coming to the Faculty of Humanities for what has become more of an annual event for the Faculty. With each visit, he conducts a workshop on writing for publication. This year, from 27 to 28 November, he again conducted such a workshop and during which ten faculty members took part.

WRITING PROPOSALS FOR FUNDING

While writing for publication is an important skill that needs to be developed in the University, it is equally important to capacitate researchers in terms of writing proposals for funding. Very little research would be possible if there was no financial support to do research.

A written proposal is often required in order to gain sponsorship or to get a grant for a proposed project. All such written proposals should contain some essential elements within them in order to ensure that serious consideration is given to the research idea. The proposal one sends therefore represents a major opportunity to get funded, hence it is of crucial importance to learn how to write it in a consistent and effective way.

DAAD (the German Academic Exchange Service [*Deutscher Akademischer Austauschdienst*]) ran a six-month intensive course for proposal writing for funding. Participants came from 13 different countries and our faculty was fortunate to be represented by Dr Mhlolo who successfully went through this course. We hope the skills he gained will rub onto other colleagues, not only in the Faculty, but in the University as a whole.



Kneeling from left to right is: Mr J. Timire, Dr A. H. Makura and Ms L. van Heerden
 Standing from left to right are: Mr R. W. Thabane, Mr D. Moliko, Ms E. du Ploy, Dr M. K. Mhlolo, Dr M. Lekhu, Prof. E. Mpofu, Mr W Manduna, Mr A. Modise. (Mr M. I. Koai absent from this photo)

NATIONAL AND INTERNATIONAL COLLABORATION

Research activities under this project are in line with the University's vision towards partnerships with public and private funding agencies and regional, national and international universities.

In July 2014, Prof. Alexander joined the CUT from the University of the Free State. At his former institution he had been involved in a research project with colleagues. Prof. Alexander's participation continued after joining the CUT, thus giving birth to an institutional collaboration between the CUT and the UFS. Towards the end of 2014, this collaboration grew further leading to an international collaboration between the University of the Free State, Mahasarakham University, Chiang Mai University, Rajabhat Maha Sarakham University and the CUT. The first project under this collaboration was the partnership in organising the Multicultural Education and Special Education (MESPED) International Conference which was hosted by Chiang Mai University in Thailand from 17 to 19 December 2014. A special invitation was extended to four delegates from the CUT to represent our university at the MESPED International Conference as part of that partnership.

Completed Master's Degrees

Du Plooy EW. 2014. *3-D Computer-aided design (CAD) and Computer Numerical Control (CNC) milling: An alternative to traditional ceramics master moulding technology*. Central University of Technology, Free State.

Beyer CM. 2014. *Litema: The revival of a disappearing art*. Central University of Technology, Free State.

Van Heerden L. 2014. *Detecting Internet visual plagiarism in higher education photography with Google™ search by image: Proposed upload*

methods and system evaluation. Central University of Technology, Free State.

Bihi KJ. 2014. *An impact assessment on in-service training programmes offered to Computer Application Technology Educators in secondary schools in the Free State Province*. Central University of Technology, Free State.

Harmse M. 2014. *The cognitive and social well-being of adolescents in the Lejweleputswa School District regarding emotional intelligence*. Central University of Technology, Free State.

Mpele OS. 2014. *Grade 10–12 educators' perceptions and experiences of safety at schools in Lejweleputswa*. Central University of Technology, Free State.

Van der Merwe M. 2014. *Perceived levels of teacher efficacy and locus of control at secondary schools in Lejweleputswa School District*. Central University of Technology, Free State.

Koalepe LJ. 2014. *Determinants of school success in the disadvantaged communities: Managerial implications for principals of high-poverty schools*. Central University of Technology, Free State.

Lebona TG. 2014. *The implementation of inclusive education in primary schools in the Lejweleputswa Education District*. Central University of Technology, Free State.

Mokhatle MB. 2014. *Factors influencing the drafting and implementation of strategic planning in schools in the Motheo District*. Central University of Technology, Free State.

Completed Doctoral Degrees

Lekhu MA. 2014. *Assessing the teaching efficacy beliefs of Science teachers in secondary schools*

- in the Free State Province. Central University of Technology, Free State.
- Mzizi NA. 2014. *Curriculum adaptations for learners with learning impairments in the foundation phase in Thabo Mofutsanyane District Free State*. Central University of Technology, Free State.
- Nkonoane MJ. 2014. *Capacity building among student affairs practitioners in higher education institutions in South Africa with regard to student governance*. Central University of Technology, Free State.
- Kgati EM. 2014. *Developing an integrated human resource development plan for office-based educators in the Free State Province*. Central University of Technology, Free State.
- Mphatsoe MF. 2014. *The role of deputy principals in managing conflict among secondary school teachers in the Lejweleputswa District in the Free State Province*. Central University of Technology, Free State.
- Segalo LJ. 2014. *The role of school governing bodies with specific reference to the provision of quality education*. Central University of Technology, Free State.
- Lekhu M & Matoti SN. 2014. Problems science educators experience in the teaching and learning of physical science in secondary schools. International Conference for Academic Disciplines, 30 June-3 July, Venice, Italy.
- Mogashoa L. 2014. The impact of the presence of international students on classroom practices: A case study of a South African university. International Conference for Academic Disciplines, 30 June-3 July, Venice, Italy.
- Setlaltoea W. 2014. Identifying educator-related variables on Grade 6 learner achievement in Mathematics. Annual National Assessment (ANA) Results, International Conference for Academic Disciplines, 30 June-3 July, Venice, Italy.
- Lekhu M & Matoti SN. 2014. Establishing a relationship between teaching efficacy beliefs of Science teachers and their educational background. International Conference for Academic Disciplines, 30 June-3 July, Venice, Italy.
- Mhlolo MK. 2014. Opening up conversations on the plight of the mathematically talented students in sub-Saharan African countries. 8th International Mathematical Creativity and Giftedness Conference, 28-31 July, Denver, Colorado, United States of America.

List of Conference Posters/Papers/Proceedings

International Conference Proceedings

- Makura AH. 2014. Postgraduate students' perceptions of learning in South Africa's culturally diverse context: Challenges and prospects. Multicultural Education and Special Education 2014, 17-19 December, Chiang Mai, Thailand.
- Mhlolo MK. 2014. Opportunities for nurturing the mathematically talented secondary school students in sub-Saharan African countries. Multicultural Education and Special Education 2014, 17-19 December, Chiang Mai, Thailand.
- Setlaltoea W. 2014. Cultural diverse Grade 12 learners' perceptions of the efficacy of Science tutors during Winter School sessions. Multicultural Education and Special Education 2014, 17-19 December, Chiang Mai, Thailand.
- Alexander G. 2014. (1.) Are schools there yet? Portrayals of multicultural education in historically white schools. (2.) Cultural responsiveness: Perceptions of education students at a university in South Africa. Multicultural Education and Special Education 2014, 17-19 December, Chiang Mai, Thailand.
- Rankhumise M. 2014. (1.) The effect of activity-based teaching methods in electric circuits. (2.) Effective teaching of energy in Grade 10 mechanics. 7th International Conference of Education, Research and Innovation, 17-19 November, Seville, Spain.
- Makura AH. 2014. Setting the tone for academic strategic planning in a turbulent environment: The role of the South African university library. International Conference for Academic Disciplines, 30 June-3 July 2014, Venice, Italy.
- National Conference Proceedings
- Mhlolo MK. 2014. Capacity building through globalization: A personal story of the benefits and pitfalls of collaborative research. SARIMA Conference, 6-10 July, Botswana.
- Zwane G. 2014. Investigating the effectiveness of active learning approaches in Economics Education in selected Mangaung schools. SASE Conference, 7-9 October, Namibia.
- Zwane G. 2014. How prepared is our first-year students at a university of technology in South Africa? SASE Conference 7-9 October, Namibia.
- Manduna W. 2014. An Information Communication Technology enriched lesson: Use of WhatsApp and Skype to enhance mathematics lesson delivery in secondary schools. SASE Conference, 7-9 October, Namibia.
- Segalo J. 2014. Teachers' experiences of the in loco parentis principle breakdown in township schools in public schools. SASE Conference, 7-9 October, Namibia.
- Segalo J. Learner pregnancy policies in secondary schools in South Africa: A legal framework. SASE Conference, 7-9 October, Namibia.
- Segalo J. 2014. Management of learner school late-coming in South African township public schools. SASE Conference, 7-9 October, Namibia.
- Rankhumise MP. Alleviating alternative conceptions and conceptual difficulties of energy in Grade 10 Mechanics. SASE Conference, 7-9 October, Namibia.
- Maimane JR. 2014. The impact of student support on students' enrolled for national certificate vocation. SASE Conference, 7-9 October, Namibia.

Maimane JR. 2014. The impact of student support on students enrolled for national certificate vocation. South African International Conference on Education, 21-23 September, Pretoria.

Rankhumise MP. 2014. The effect of activity-based teaching method on students' achievement on electric circuit concepts. South African International Conference on Education, 21-23 September, Pretoria.

Modise A. 2014. Challenges facing student teachers during practice teaching. SASE Conference, 7-9 October, Namibia.

Modise A. 2014. Challenges in teaching and learning of cash flow statement in secondary schools in Free State Province. SASE Conference, 7-9 October, Namibia.

List of Journals/Articles (DHET subsidised)

Alexander G & Mpisi A. 2014. Issues influencing black learners' scholastic experiences in ex-Model C further education and training schools. *Journal of Sociology & Social Anthropology*, 5(3), pp. 349-359.

Badenhorst JW & Koalepe LJ. 2014. How do we manage? Determinants of effective leadership in high-poverty schools. *Journal of Social Sciences*, 39(3), pp. 243-256.

Bihi JK & Selesho JM. 2014. Examining reflections of Computer Application Technology (CAT) educators on in-service training as continuous professional development aspect. *Pensee Journal*, 76(8), pp. 218-226.

Bihi JK & Selesho JM. 2014. Assessing computer self-efficacy of Computer Application Technology educators: The significant nature. *JoKull Journal*, 64(10), pp. 298-308.

Makura AH & Toni N. 2014. Managing the links between academic development and scholarship of teaching and learning: The case of South African Universities. *International Journal of Educational Sciences*, 6(1), pp. 85-93.

Shumba A & Makura AH. 2014. Drug abuse by learners in South Africa: A replication and extension study. *Journal of Psychology in Africa*, 24(2), pp. 197-199.

Manduna WM. 2014. Access-usage qualities of information technology in a higher education setting. *Journal of Psychology in Africa*, 24(2), pp. 200-202.

Matoti SN. 2014. Approaches to learning by pre-service students of an institution of higher learning: An exploratory study. *Journal of Psychology in Africa*, 24(4), pp. 385-387.

Meda L. 2014. The mist that they declared to be over is still around: Xenophobic experiences of refugee children living at a country centre in South Africa. *Child Abuse Research in South Africa*, 15(2), pp. 72-82.

Mhlolo MK. 2014. Performance Appraisal Systems – Equity perceptions of mathematics teach-

ers: An exploratory study. *Journal of Psychology in Africa*, 24(6), pp. 487-491.

Mhlolo MK & Schafer M. 2014. Potential gaps during the transition from the embodied through symbolic to formal worlds of reflective symmetry. *African Journal of Research in Mathematics, Science and Technology Education (AJRMSTE)*, 18(2), pp. 125-138.

Modise AM. 2014. School and community participation of in-school teenagers affected by orphanhood in a rural South Africa setting. *Journal of Psychology in Africa*, 24(5), pp. 453-456.

Moeketsi VSM. 2014. In between hope and hopelessness in contemporary spaces: A case of ES Segoete's novel *Monono ke Mohodi ke Mouwane* (Riches are short-lived). *Journal of Sociological Sciences*, 40(1), pp. 21-28.

Moeketsi VSM. 2014. The demise of Sesotho language in the democratic South Africa and its impact on the sociocultural development of the speakers. *Journal of Sociology & Social Anthropology*, 5(2), pp. 217-224.

Ntshoe IM. 2014. Essaying purposes and specialisations of institutional types in knowledge production. *Studies in Higher Education*.

Ntshoe I & Selesho JM. 2014. Investing in leadership, governance and management to improve quality of teaching and learning: A human capital perspective. *International Business & Economics Research Journal*, 13(3), pp. 475-484.

Phindane PA. 2014. The interpretation of "Tlhahisoleseding" vs. "Tlhahisolesedi". *International Journal of Educational Sciences*, 6(2), pp. 357-368.

Phindane PA. 2014. Reading skills acquisition in English: A comparison of monolingualism and bilingualism in foundation phase. *Journal of Psychology*, 5(1), pp. 85-96.

Phindane PA. 2014. The interpretation of "Botlokotsebe" vs. "Bosenyi". *Journal of Social Sciences*, 41(2), pp. 143-150.

Setlallentoa WN. 2014. School self-evaluation: How involved are educators in the process? *International Journal of Educational Sciences*, 7(3), pp. 525-533.

Setlallentoa WN. 2014. Analysing scaffolding from not knowing to knowing numbers and counting: Classroom conversations in the teaching of numeracy. *International Journal of Educational Sciences*, 6(2), pp. 227-232.

Shumba A & Makura AH. 2014. Drug abuse by learners in South Africa: A replication and extension study. *Journal of Psychology in Africa*, 24(2), pp. 197-199.

List of Journals/Articles (not DHET subsidised)

Modise MA & Magano MD. 2014. Challenges faced by learners affected by HIV/AIDS in Secondary Schools of Botshabelo, Free State Province. *Mediterranean Journal of Social Sciences*.



Modise MA & Fumane PK. 2014. Pedagogical challenges in teaching Accounting as an integrated subject in Grade 9 in Lejweleputswa Senior Phase Schools in Free State Province. *Mediterranean Journal of Social Sciences*.

Maimane JR, Khabanyane KE & Ramabenyane MJ. 2014. A critical reflection of Transformative Learning as experienced by student teachers during school-based learning. *Mediterranean Journal of Social Sciences*.

Maimane JR. 2014. An evaluation of the Assessment process used in an educational development programme: A case of the Advanced Certificate in Education (ACE) Project in Bloemfontein, South Africa. *Mediterranean Journal of Social Sciences*.

Khabanyane KE, Maimane JR & Ramabenyane MJ. 2014. A critical reflection on transformative learning as experienced by student-teachers during school-based learning. *Mediterranean Journal of Social Sciences*.

Maimane JR & Rankhumise MP. 2014. The name of the game is mathematics: How do mathematics teachers of primary schools motivate learners? *Mediterranean Journal of Social Sciences*.

Maimane JR. 2014. South African Black learners' perceptions of their mathematics teachers. *Mediterranean Journal of Social Sciences*.

Naude FA. 2014. Preparing the learners for the future: What is crucial beyond a Grade 12 Certificate? *Mediterranean Journal of Social Sciences*.

Naude FA. 2014. Differentiated and career-directed education: A means to improve the Teaching/Learning Effectiveness in South African Schools. *Mediterranean Journal of Social Sciences*.

Alexander G, Van Wyk M & Moreeng BB. 2014. Constructing student-teacher identities via a mentorship programme initiative: A case for school-based learning. *Mediterranean Journal of Social Sciences*.

Makura AH. 2014. Students' perceptions of ICT use in Higher Education. *Mediterranean Journal of Social Sciences*.

Matheolane RM & Makura AH. 2014. The management of human rights education in Lesotho Schools. *Mediterranean Journal of Social Sciences*.

Moeketsi VSM. 2014. In between hope and hopelessness in contemporary spaces: A case of E.S Segote's Novel *Monono ke Mohodi ke Mouwane*

(Riches are Short-lived). *Mediterranean Journal of Social Sciences*.

Mhlolo MK. 2014. Is rote learning of number concepts inherently rotten or is it just a blame and shame game that vitiates principles of natural progression? *Mediterranean Journal of Social Sciences*.

Badenhorst JW & Koalepe LJ. 2014. How do we manage? Determinants of effective leadership in high-poverty schools. *Mediterranean Journal of Social Sciences*.

Bihi J & Selesho JM. 2014. The impact of in-service training on computer application educators: Challenges experienced and skills acquired. *Mediterranean Journal of Social Sciences*.

Rankhumise MP & Raphoto MS. 2014. The effect of inquiry-based teaching-learning sequence in ameliorating alternative conceptions and conceptual

difficulties of conservation of mechanical energy. *Mediterranean Journal of Social Sciences*.

Rankhumise MP. 2014. Using activity-based instructional approaches in electric circuits. *Mediterranean Journal of Social Sciences*.

Rankhumise MP, Raphoto S & Maimane JR. 2014. Effective teaching of conservation of mechanical energy. *Mediterranean Journal of Social Sciences*.

Rankhumise MP & Imenda SN. 2014. Using a bicycle analogy to alleviate students' alternative conceptions and conceptual difficulties. *Mediterranean Journal of Social Sciences*.

Mhlolo MK. 2014. Theory practice dichotomy in Mathematics Teacher Education: An analysis of practicum supervision practices at one Teacher Training College in Zimbabwe. *Mediterranean Journal of Social Sciences*.



A Message from the Research Professor

Prof. I Ntshoe

The ongoing debates about universities of technologies (UoTs) since their creation in 2003 relate to research on distinctiveness of the sector in terms of purposes, foci, mandates, curricula design and pedagogy. In responding to these challenges, I was appointed as a Research Professor by the Central University of Technology, to develop vocational pedagogy as a scholarly niche area in UoTs in general, and at the CUT in particular.

This project currently housed in the Faculty of Humanities has been running since July 2010, focusing on research into curricula design and pedagogy of the different fields of practices as scholarly niche area. Ongoing activities in the project are: workshops, seminars and colloquia organised by the research professor and facilitated by renowned scholars, including Prof. Michael Young of the London Knowledge Laboratory, University of London, United Kingdom. Work-

shops, seminars and colloquia were intended for a core group of staff drawn from the Faculties of Engineering, Health Sciences, Humanities and Management Sciences at the CUT.

The project has resulted in articles developed by the research professor, members of the core and master's and doctoral research studies focusing on curriculum and pedagogy of professional and sectorial fields of practice offered by UoTs. Recently, the project has been extended to research into development of a common approach to curricula design and pedagogy (teaching and learning) in UoTs and in Further Education and Training (FET) Colleges.

This project has been used as a springboard for collaborations between the CUT, FET and FET Directorate in the Free State.

Faculty of Management Sciences



A Message from the Dean

Prof. A Strydom

The Faculty of Management Sciences is fully committed to reach the targets set out in the CUT's Research and Development Plan 2014-2020. The year 2014 was a remarkable one in the sense that we recorded a growth of 50% in terms of publications in accredited journals compared to 2013. In fact, if the growth rate is calculated over the past seven years, it is almost 175%. Despite this, the Faculty is still facing challenges in terms of

broadening its research participation base, increasing the number of full-time postgraduate students, internationalisation in research and improvement of staff qualifications. We will continue to address these challenges in an attempt to position the Faculty as a role-player to reckon in the global arena.

My sincere appreciation to the Research Manager and all contributors to a very successful 2014!



A Message from the Research Manager

Prof. C Chipunza

For 2014, there are notable strides which indicate increased participation in research-related activities by staff and postgraduate students. These range from staff enrolling for higher qualifications, number of approved students' proposals, staff and student attendance of seminars and workshops, conference attendance demands, both local and international, as well as publications in accredited journals. The Faculty successfully published an edition of the institutionally published journal *INTERIM*. There was a revision of the BTech Research Methodology to ensure uniformity of content across the whole Faculty. The Faculty identified academic writing as a priority in preparing students for postgraduate studies. The year 2014 also witnessed a new *modus operandi* for the Annual Prestige Seminar. Staff presentations were divided into categories and postgraduate students also presented. Provision was made for any staff member to attend FRC meetings as observers to learn more about research. Seventeen staff members were grant-

ed the DHET grant to support them with their postgraduate studies, while four black women benefited from the Focused Researchers Career Programme. Seven staff members attended the African Doctoral Academy Programme at Stellenbosch University.

Despite these achievements, a number of research issues still bedevil the Faculty. These are, among others, the need to increase the number of staff who are publishing and avoid relying on the same people every year; participation by staff members in NRF applications, including for rating; collegiality in research publications (many staff members still publish as individuals). There is also a need for interdisciplinary research, as well as an increase in the number of postgraduate students registered on a full-time basis. More mechanisms will have to be put in place to ensure a better throughput rate of our postgraduate students in 2015. Lastly, the level of supervision among some staff members in the Faculty needs attention as well.

“The Faculty identified academic writing as a priority in preparing students for postgraduate studies

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ESKOM POSTGRADUATE PROJECT

The Eskom Postgraduate Project is housed in the Department of Business Support Services. It was launched in February 2014 and currently there are 15 master's students enrolled.

The value of the project is over R1 million. The students attend workshops every two weeks, and supervision has been sought from other departments in the Faculty.

Completed Master's Degrees

Coleman WJ. 2014. *The development and practical implementation of a project management model for enhancing new venture creation success*. Central University of Technology, Free State.

Maime RB. 2014. *Challenges and opportunities of adopting management information systems (MIS) for passport processing: A comprehensive study between Lesotho and South Africa*. Central University of Technology, Free State.

Ndjike Tassin RE. 2014. *Transiting from informal to formal business: Motives, challenges and the coping mechanisms of selected transited businesses in the Bloemfontein area*. Central University of Technology, Free State.

Matlanyane L. 2014. *Local governance in post-1993 Lesotho: An analysis of the role of traditional leaders*. Central University of Technology, Free State.

Mhlanga O. 2014. *Expectations and experiences of formal full-service restaurant diners in Port Elizabeth*. Central University of Technology, Free State.

Ramarumo RG. 2014. *The impact of organisational culture on job stress and burnout in graded hospitality establishments in the Free State Province*. Central University of Technology, Free State.

Maphakisa MD. 2014. *Effectiveness of ABSA business bank's Customer Relationship Management Practices in maintaining loyalty among customers in the Eastern Cape Province*. Central University of Technology, Free State.

Completed Doctoral Degrees

Chipunza LT. 2014. *Driving innovation in Small Accommodation Businesses: A comparative study of Zimbabwe and South Africa*. Central University of Technology, Free State.

Dzansi LW. 2014. *An organisational justice perspective on the impact of human resource management practices on the quality of service delivery in municipalities in the Free State Province of South Africa*. Central University of Technology, Free State.

List of Conference Papers

International Conferences

Olivier CD. 2014. Capacity and competency as requirements for effective and efficient service delivery in local government: A South African perspective. Annual Conference of the International Institute of Administrative Sciences, 11-17 June, Al Akhawayn University, Ifrane, Morocco.

Haarhoff R. 2014. The price competitiveness of air transport: A South African case study. Air Transport Research Society Conference, Bordeaux, France.

Fourie W. 2014. The intricacy of branding: The role of planning in sport events. International Conference on Sport Tourism, 10-12 December, Coimbra, Portugal.

Coughlan L. 2014. Internal job satisfaction influencing selected five-star hotel employees' overall job satisfaction. Values of Tourism Conference, Copenhagen, Denmark.

Kokt D. 2014. HIV and AIDS policy implementation. The case of a major South African hotel group. Advances in Hospitality and Tourism Marketing and Management Conference, 25-27 June, Le Meridien, Mauritius.

Dzansi DY. 2014. Attitude of South African SMMEs towards Business Social Responsibility (BSR): Influence of organisational variables of small-scale manufacturing firms. International Conference on Emerging Trends for Sustainable Development and Human Capacity Building in the Third World Nations (ICETSDHCB 2014), 28-31 May, University of Ghana.

Dzansi LW. 2014. Employees' perceptions of fairness of Human Resource Management practices and their citizenship behaviour in selected municipalities in South Africa. ICMBM 2014 (18-23 November). IEDRC Organisers, Best Western Hotel, Galles, Italy.

Amoakoh EO. 2014. The level of educational background of owner/manager of small businesses as a factor related to the practice of marketing research: Hair Salons Perspective. ICMBM 2014 (18-23 November). IEDRC Organisers, Best Western Hotel, Galles, Italy.

Makola S. 2014. The effectiveness of using a multidisciplinary teams approach in a mental health care facility in South Africa. Hong Kong International Conference on Social Science (HKICSS 2014), 2-4 October, Regal Riverside Hotel, 34-36 Tai Chung Kiu Road, Shatin, Hong Kong, China.

Naong M. 2014. Emotional Intelligence (MI) as a critical enabler for South Africa's SMME success. 29th International Business Research Conference, 24-25 November, Novotel Hotel, Sydney Central, Sydney, Australia, World Business Institute.

National Conferences

- Chipunza LT, Chipunza C & Dzansi DY. 2014. The influence of transformational leadership on innovation and firm performance among small owner-managed businesses in Zimbabwe. Annual SAIMS Conference, 14-17 September, Vanderbijlpark.
- Chipunza LT, Dzansi DY & Naong T. 2014. The influence of firm size on market orientation among small owner-managed businesses in developing economies. Annual SAIMS Conference, 14-17 September, Vanderbijlpark.
- Dzansi DY & Okyere F. 2014. The influence of organisational variables of South African SMMEs on attitudes towards business social responsibility: The case of small-scale manufacturing firms in the Botshabelo industrial area. Annual SAIMS Conference, 14-17 September, Vanderbijlpark.
- Dzansi LW. 2014. The relationship between municipal employees' perceptions of HRM practices and political interference within selected municipalities in South Africa. LAMIPISA International Conference, Cape Town, South Africa.
- Sebolao RR. 2014. Integrating indigenous knowledge of selected rural areas of the Northern Cape into development project management. LAMIPISA International Conference, 9-10 September, Cape Town, South Africa.
- Kokt D. 2014. Reflecting on Information Communication Technology (ICT) in marketing from a marketer's and student's perspective. Business and Management Conference, University of KwaZulu-Natal, 17-19 September, Durban, South Africa.
- Kokt D & Hattingh JL. 2014. Current dynamics of urban tourism in Bloemfontein. 3rd Business Management Conference, 2014 (BMC), 17-19 September, Durban, South Africa.
- Naong M. 2014. Skills transfer as a moderator to perceived organisational climate and employee performance: A case study of selected South African companies. Business Management Conference 2014, 17-19 September.
- Von Benecke G. 2014. The future audit of internet casinos (RSA): Analysis crucial to mitigating significant risk to the auditor. 4th African Accounting and Finance Conference (AAFC), 2-5 September, Cape Town, South Africa.
- De Freitas EMB. 2014. Trust asset distributions: A potential value shifting arrangement. 4th African Accounting and Finance Conference (AAFC), 2-5 September, Cape Town, South Africa. (International Conference in RSA.)
- De Freitas EMB. 2014. Trust beneficiaries changes a potential value shifting arrangement. Southern African Accounting Association (SAAA) Central Region Conference, 25-26 September, Potchefstroom, South Africa.
- Makola S. 2014. Sense of meaning and study persistence and perseverance in an institution of higher learning in South Africa. 20th South African Psychology Congress, Durban, South Africa.
- Olivier CD. 2014. The importance of budget reform in the successful implementation of public sector reform. Annual Conference of International Association of Schools and Institutes of Administration (IASIA), Nelson Mandela Metropolitan University, 30 June-4 July, Port Elizabeth, South Africa.
- Nothnagel J. 2014. Postgraduate supervision as category boundary work. Business Management Conference, University of KwaZulu-Natal, 17-19 September, Durban, South Africa.
- Meyer B. 2014. Green golf tourist: A fact or a fad: Golfer's perception. Business Management Conference, University of KwaZulu-Natal, 17-19 September, Durban, South Africa.
- De Freitas EMB. 2014. Trust beneficiaries changes a potential value shifting arrangement. Southern African Accounting Association (SAAA) Central Region Conference, 25-26 September, Potchefstroom, South Africa.
- Steenkamp L. 2014. Mind the expectation gap: Auditing bodies corporate. Southern African Accounting Association (SAAA) Central Region Conference, 25-26 September, Potchefstroom, South Africa.
- De Villiers C. 2014. Exploring key considerations when determining bona fide inadvertent errors resulting in understatements. Southern African Accounting Association (SAAA) Central Region Conference, 25-26 September, Potchefstroom, South Africa.
- Makola S. 2014. Using the dialectic process of integral meaning to assist a patient to resolve existential void. First International Conference of the Forum of African Psychology, Polokwane, South Africa.
- Makola S. 2014. Comparing persistence amongst students with low and high sense of meaning at an institution of higher learning in South Africa. 8th International Technology, Education and Development Conference – INTED.

List of Conference Proceedings

- Makhalemele N & Rambe P. 2014. Relationship between managerial competencies of owners/managers of emerging technology firms and business performance: A case of Internet cafés in Mangaung Province in South Africa. Proceedings of the 2nd International Conference on Advances in Social Science, Economics and Management Study, SEM 2014, Institute of Research Engineers and Doctors, pp. 104-112, 16-17 November, Birmingham, United Kingdom.
- Rambe P & Agbobli E. 2014. Exploring the role of innovation in promoting performance of small rural SMMEs: A case study of small-scale agricultural enterprises in the Vryburg region of South Africa. Proceedings of the Second International Conference on Advances in Social Science, Economics and Management Study – SEM 2014, pp. 113-120, Institute of Research Engineers and Doctors, 16-17 November, Birmingham, United Kingdom.
- Rambe P, Ndjike R & Dzansi D. 2014. The role of emerging educational technology in the transformation of educational programmes and structures at a South African university: The case of STEPS at the Central

University of Technology. Proceedings of the 2nd International. Conference on Advances in Social Science, Economics and Management Study – SEM 2014, pp. 92-103. Institute of Research Engineers and Doctors, 16-17 November, Birmingham, United Kingdom.

De Freitas EMB. 2014. Trust beneficiaries changes a potential value shifting arrangement. Southern African Accounting Association (SAAA), Central Region, 1: pp. 27-45.

Makola S. 2014. The effectiveness of using a multi-disciplinary teams approach in a mental health care facility in South Africa. Hong Kong International Conference on Social Science 2014, 2-4 October, Hong Kong.

Makola S. 2014. Comparing persistence amongst students with low and high sense of meaning at an institution of higher learning in South Africa. 8th International Technology, Education and Development Conference – INTED.

List of Journals/Articles (DHET subsidised)

Rambe P & Ng'ambi D. 2014. Learning with and from Facebook: Uncovering power asymmetries in educational interactions. *Australasian Journal of Educational Technology*, 2014, 30(3), 312.

Hattingh Z, Le Roux M, Nel M & Walsh D. 2014. Assessment of the physical activity, body mass index and energy intake of HIV-uninfected and HIV-infected women in Mangaung, Free State Province, *South African Family Practice*, 56(3), pp. 196-200.

Mhlanga O, Hattingh Z & Moolman HJ. 2014. The effect of restaurant attributes on customers' expectations and experiences in formal full service restaurants in Port Elizabeth, South Africa. *African Journal of Hospitality, Tourism and Leisure*, 3(1).

Dzansi DY & Biga P. 2014. Trokosi' – Slave of a Fetish: An empirical study. *Studies of Tribes and Tribals*, 12(1): pp. 1-8.

Smit L & Van Niekerk T. 2014. Selecting a pricing strategy: A statistical approach. *Journal for New Generation Sciences*, 12(1), pp. 141-157.

Nyawasha TS & Chipunza C. 2013. Radio broadcasting in the era of HIV/AIDS: Can this be the magic bullet? *International Social Work*. First published 5 June 2013. DOI: 10.1177/0020872813477883.

Chipunza LT & Chipunza C. 2014. The influence of selected demographic variables on the choice of bootstrap financing methods in small owner-managed businesses in Zimbabwe. *Journal of Economics*, 5(2): pp. 219-229.

Dzansi DY & Amoakoh EO. 2014. Does marketing research really matter for smaller businesses under competition? A case study of hair salons in Dr Ruth S Mompoti District, South Africa. *Journal of Economics*, 5(1): pp. 7-16.

Jonck P. 2014. The mitigating effect of work-integrated learning on graduate employment in South Africa. *Africa Education Review*, 11:3, pp. 277-291, DOI.

Naong NM. 2014. The impact of skills development training on lower-level employees' motivation and job satisfaction: A case study of five South African companies. *Mediterranean Journal of Social Sciences*, 5(20), pp. 369-380.

Dzansi DY & Atiase VY. 2014. Reflecting on micro-finance in poverty reduction. *Mediterranean Journal of Social Sciences*, 5(21), pp. 321-327.

Dzansi DY & Tasssin-Njike R. 2014. Understanding the transition from informal to formal business: A conceptual framework. *Mediterranean Journal of Social Sciences*, 5 (20), pp. 664-670.

Chipunza C. 2014. Gender and field of study as determinants of perceptions regarding employment prospects among final-year students: Case of a university of technology in South Africa. *Mediterranean Journal of Social Sciences*, 5(20), pp. 3017-3031.

Coughlan LM, Moolman HJ & Haarhoff R. 2014. External job satisfaction factors improving the overall job satisfaction of selected five-star hotel employees. *South African Journal of Business Management*, 45(2), pp. 97-102.

Jacobs H & Teise VN. 2014. The roles of work-integrated learning in achieving critical cross-fields outcomes in a hospitality management programme. *Journal for New Generation Studies*, 12(1), pp. 89-102.

Monnapula-Mapesela M. 2014. Sustainable development as social equity: Policy contradictions and their impact on higher education. *South African Journal of Higher Education*, 28(3a), pp. 866-884.

Kokt D & Strydom AJ. 2014. Reflecting on industry and student expectations for working in the tourism and hospitality industry: A case study. *South African Journal for Research in Sport, Physical Education and Recreation*, 2014, 36(1): pp. 119-130.

Dzansi DY & Amedzo K. 2014. Integrating ICT into rural South African schools: Possible solutions for challenges. *International Journal of Education Science*, 6(2): pp. 341-348.

Mateusi CM, Khoaeane JT & Naong MN. 2014. Challenges of inclusive education: Lesotho case study. *International Journal of Education Science*, 6(2): pp. 263-273.

Rambe P & Mlambo S. 2014. Using digital storytelling to externalise personal knowledge of research processes: The case of a Knowledge Audio Repository. *Internet and Higher Education*, 22 (2014): pp. 11-23.

Dzansi DY, Rambe P & Mathe L. 2014. Cable theft and vandalism by employees of South Africa's electricity utility companies: A theoretical explanation and research agenda. *Journal of Social Sciences*, 39(2): pp. 179-190.

Van der Walt F & De Klerk JJ. 2014. Measuring spirituality in South Africa: Validation of instruments developed in the USA. *International Review of Psychiatry*, 26(3): pp. 368-378.

Van der Walt F & De Klerk JJ. 2014. Workplace spirituality and job satisfaction. *International Review of Psychiatry*, 26(3): pp. 379-389.

Odora DRJ & Naong MN. 2014. Distigmatisation of apprenticeship: A vehicle for entrepreneurship promotion and job creation among further education and training college students. *Journal of Asian and African Studies*, 49: pp. 457-472.

Mateusi CM & Naong MN. 2014. Giving voice to the voiceless: A case study of learners with impairments in Lesotho schools. *Journal of Social Sciences*, 39(3): pp. 337-349.

De Klerk B & Haarhoff R. 2014. The green game: Investigating golf management practices. *African Journal of Hospitality, Tourism and Leisure*, 3(2): pp. 1-14.



Report from Research Professors

Prof. D Kokt – Leisure Management:

The focus of the research professor was mainly on human resources issues in the tourism and hospitality industry. The fact that there is no doctorate for the programmes Tourism and Hospitality Management is a complicating factor. Students in this area also tend to work in industry and not many pursue further studies in this field. The outputs for 2014 are as follows:

Publications:

Kokt D & Strydom AJ. 2014. Reflecting on student and industry expectations for working in the tourism and hospitality industry: A case study of the Central University of Technology, Free State (CUT). *South African Journal for Research in Sport, Physical Education and Recreation*, 36(1): pp. 119-130.

Proos E & Kokt D. 2014. Demographic profile and service delivery expectations of visitors to the Bloemfontein Vryfees. *INTERIM*, 13(2): pp. 47-58.

Completed supervision:

R Ramarumo – MTech (Tourism and Hospitality Management).

A book project was conceptualised and finalised in 2014 with a project grant from R50 000 from the Research and Innovation Office. It involved inputs from senior and junior staff in the Hotel School and the Department of Tourism and Event Management. The project afforded staff members the opportunity to publish a chapter in a book and to be exposed to science writing. The book was published in January 2015. (Kokt D. 2015. *Hospitality Management: A practical introduction*. Bloemfontein, SUN MeDIA.)

FOSTERING STRATEGIC PARTNERSHIPS

The following research partnerships were fostered:

Institution	Nature of partnership	Activities in 2014
ESKOM	Capacity Development	The Faculty has a memorandum of understanding with ESKOM for the master's programme.
Free State Tourism Authority	Research partnership	MOU was signed between the Faculty of Management and the Free State Tourism Authority as their official research partner.

POSTDOCS

The Faculty of Management Sciences was allocated one postdoc who is now working on a joint project on sustainability with the Faculty of Engineering and Information Technology.

PART 4

Research and
Development

INSTITUTIONAL PRIORITIES: THE ENABLING ENVIRONMENT

The Central University of Technology, Free State's Research and Development Plan 2014-2020 was implemented during the first term of 2014.

During 2013, all role-players engaged with Research and Innovation Strategies towards fulfilment of Vision 2020's committed research and innovation outputs. As a result of a two-day workshop, a Research and Development Plan 2014-2020 was drafted and approved by Senate in August 2013.

The University's Vision 2020 articulates the 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 aligned its strategies with the 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 with international best practice in research management.

The focus of all research and development activities is that they result in *outputs*, *outcomes* and *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*.

The Plan

The following plan was drafted:

Focus	Objective	Activity
Scholarly development through Research and Innovation Training	Scholarly engagement with the research process and research cycle	<ul style="list-style-type: none"> ● Pre-doctoral training ● Doctoral training ● Postdoctoral 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	<ul style="list-style-type: none"> ● Multi-, inter- and transdisciplinary 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	<ul style="list-style-type: none"> ● Student retention and throughput ● Publications ● Conference attendance ● Patents ● Rated researchers ● Research funding



The following strategies will support this plan:

5 Key Focus Areas	18 Strategies Aligned to the Key Focus Areas		
Human Skills and Potential Development Strategies	Strategy 1: Ten integrated support programmes to grow research capacities.	<ul style="list-style-type: none">Undergraduate to Graduate Students ProgrammeMaster’s Education ProgrammeDoctoral Education ProgrammeNext Generation Researcher ProgrammePostdoc Fellowship ProgrammeEmerging Researchers Programme	<ul style="list-style-type: none">Mid-career Researcher ProgrammeEstablished Researcher ProgrammeBlack Female Researchers Career ProgrammeRated 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 opportunity for research participation.	
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.		
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.		
Resource Strategies	Strategy 1: Allocation of Institutional Research Grant.		
	Strategy 2: Allocation of DHET Research and Development Grant.		
	Strategy 3: Revising the allocation of publication incentives.		
	Strategy 4: Strategy to grow research equipment and facilities.		
	Strategy 5: Revise funding allocation to students.		
Policy Strategies	Strategy 1: Revising institutional research policies to reflect the new institutional framework for Research and Development.		

SIGNIFICANT DEVELOPMENTS AND ACHIEVEMENTS IN RESEARCH

Based on the R&D Plan 2014 -2020, which is aligned to five focus areas and eighteen strategies, the following annual progress can be noted:

Budget

In March 2014, Council approved R13m to support the University's Strategic Research and Development Programmes, Research and Innovation Operational Budgets and the pay-out of 2012 research publication incentives.

The budget allocations were based on four objectives:

- Growing research participation and outputs.
- Growing priority areas such as STEM Research, black female staff members with doctorates and a next generation of researchers.
- Attracting high-quality students who can complete especially doctoral studies.
- Outputs based on performance in publications and completed qualifications.

The aim of the budget was to capacitate the research community in the following manner:

- Based on these priorities, 60 new master's and doctoral students could benefit from this allocation.
- 250 (cumulative) could benefit from earmarked funding – for example staff who recently completed their doctoral studies, emerging researchers, supervisors of completed studies, staff who published and so forth.
- 7 full-time postdocs could participate in the University's research programmes.
- Developmental opportunities, e.g. through sabbatical leave programmes, mentorship programmes, seminars, capacity-building workshops and the journal *INTERIM*, would be available.

Faculties had operational research funds of R3m available to support a variety of research activities and programmes as identified in their Research Plans.

DHET R&D Grant 2014-2015

Through the DHET Research and Development Grant, the University was awarded R5 190 000 for 2014-2015. The grant's major focus is on capacity development (especially) through growing the number of staff holding master's and doctoral qualifications. This will support the University's own challenge in this regard. In 2013, the University had 67 permanent academic staff at senior lecturer/associate professor and professor level and 221 at lecturer and junior lecturer level (Total: 288). During this period, 82 permanent academic staff had doctoral and 117 had master's degrees. The qualifications profile has an impact on the research performance and research outputs of the University.

The University is mindful that the growth of a research culture is dependent on a number of challenges. Some of these challenges are:

- 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 in some academic programmes, high volume of part-time postgraduate students and a small critical mass of staff contribute to limited participation in research activities.

Based on the identified criteria by the DHET, a plan to use the R5 190 000 in support of the R&D strategies was submitted to the DHET on 28 February 2014.

The DHET approved the plan only in October 2014. The Research and Development Unit and the Faculties are now in a process to implement the plan.

A DHET Research and Development Grant was awarded to the University to the value of R4 430 000 for the financial year 2013-2014. The purpose of the grant was to support the University to meet its shortfall with regard to research publications and completed postgraduate qualifications.

The DHET confirmed the approval of the R&D proposal on 27 August 2013. All projects were then fully implemented for roll-out. R3 534 316 was either spent or committed during this period. R905 329 will be used during the financial year 2014-2015.

The next table reflects the expenditure during 2013-2014:

Table: DHET funding expenditure 2013-2014

Amount Carried Over from 2012/13	Budgets approved by Department 2013/14	Interest earned in 2013/14	Total allocation for 2013/14
(A)	(B)	(C)	D = A+B+C
-	4,430,000	9,645	4,439,645

Items/categories that funds were spent on	Expenditure in 2013/14 (give cut-off date) 31 March 2014	Funds committed	Total of expenditure in 2013/14 plus funds committed	Unspent Funds*
	(E)	(F)	G = E + F	H = D – G
Postgraduate bursaries	1,590,000		1,590,000	
Postdoctoral fellowships	945,000		945,000	
Capacity building among staff, including qualifications and mentorships	46,718		46,718	303,282
Research related training workshops, example how to write or publish or supervise, etc.	267,081		267,081	52,919
Academic exchanges	-		-	180,000
Funding for research activities (local and international)		250,517	250,517	359,483
Topping up NRF grants	435,000		435,000	
TOTAL	3,283,799	250,517	3,534,316	905,329

The carry-forward plans and budget was only approved by the DHET in October 2014.



RESEARCH STRATEGIC BREAKAWAY

The Research and Development strategic breakaway – themed “*Fingerprints*” – was held on 4 August 2014 in order to allow engagement on the implementation of Research and Development Strategies towards fulfilment of Vision 2020’s committed research outputs. The implementation is done based on strategies aimed at increasing research outputs and in line with the framework of the Research Management Model – five focus areas with eighteen strategies. During the workshop, the University research community engaged on (1) Overview and Performance of Research and Development, (2) Growing participation basis in research activities, (3) Postgraduate studies, (4) Strides for Research, and (5) Research & Development budget.

A total of 68 staff members and invited guests were in attendance. The University research community provided the DVC with a mandate of commitment to the Research and Development Plan 2014-2020. Key critical research enablers were identified in promoting a culture of research within the University. There is a need for the CUT to be defined as a niche University – *What the university is known for*. The formation of research clusters and a multi-, inter- and transdisciplinary approach to research are sound strategies in defining the University research niche and programme mix. This will make it easier for the University to be competitive – obtain external funding and develop, attract and retain seasoned researchers. The approach to research requires collaboration and a vibrant research culture supported by clear research agenda, a balanced ratio or proportion of teaching versus research involvement, alignment

with regional and continental strategic imperatives, internationalisation of curriculum, for example the change of the DTech to a PhD, growing the University research community, building critical mass in research, and financing of the research strategic plan.

RESEARCH AND DEVELOPMENT WORKSHOPS

The following workshops were offered during 2014:

Research Process

On 28 February 2014, the Unit for Research and Development launched its first annual Research and Development workshop. The focus of the workshop was on “The research process.” According to the Research Office’s records, 170 staff and students registered for the workshop. The workshop reflected on a number of important milestones during the research process. The presentations were collected and were available as a research workbook during the seminar. This workbook was also made available on the Internet.

Research and Integrity

On 22 May 2014, the Unit for Research and Development launched its second annual Research and Development Workshop. The focus of the workshop was on “Research ethics and integrity.” Although research ethical codes are not new to the higher education environment, it appears as if researchers’ scientific behaviour is not always beyond doubt. Many examples across the



world suggest possible scientific malpractice. Following from this suggestion, some concerns can be raised. Two burning questions are (a) whether research codes are sufficient to prevent scientific malpractice and (b) whether researchers can be trained to become more ethical.

According to the Research Office's records, 40 staff and students registered for the workshop. The workshop reflected on a number of important guidelines how to deal with ethical and integrity challenges during the research process.

The presentations were collected and were available as a research workbook during the seminar. This workbook will also be made available on the Internet.

PUBLICATION WRITING

On 22 August, a workshop on publication writing was presented and attended by 80 students and staff members. The purpose of the workshop was to inform staff and students on how to write a research paper.

RESEARCH CENTRES, UNITS AND GROUPS

The Senate approved a University Policy on Centres, Units and Groups on 25 August 2014. Council approved the policy on 12 September 2014. The Policy was informed by the University Research and Development Plan 2014-2020 which was approved by Senate and Council in 2013. The objectives of the Plan are directed at building a critical mass in research and optimising opportunities to grow research outputs. The Plan identified the approved Research Clusters and Programmes as a meaningful vehicle to meet the outputs of the Plan by 2020. Strategy 2 of the Plan suggests meaningful structural support to achieve the desired outputs. One such mechanism is research performed by a critical mass organised in Centres/Units/Groups.

The University is conscious of the fact that this exercise is the most important process which has been undertaken by the institution in the grouping and identification of research niche areas. In order to ensure success of the process and sustainability of the approved entities, the process allows a progressive

development of entities – from Group to Unit to Centre; the development will involve a peer review mechanism which will assist in achieving of outputs and also the refocusing of research within the various Faculties.

In 2014, 17 applications consisting of four Centres, nine Units and four Groups were received by the University Research Committee on recommendation by the Faculties. The documents served before the Senate meeting on 10 November 2014 and no final conclusion on these submissions was reached as the time to present all these applications was too limited. A special Senate meeting will be held to deal with all these applications in 2015.

RESEARCH CLUSTERS AND PROGRAMMES

Strategic 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.

All Research Centres, Units and Groups will be linked to the strategic Research Clusters and Programmes.

A process was undertaken of redefining research clusters of the University and the ensuing report was presented at the URIC on 27 November 2014. The URIC resolved that:

- The members took note of the three clusters and that no formal decision was to be taken at that stage.
- The Faculties will attend to the programmes and the projects which form the clusters.
- A workshop in the first semester of 2015 where possible changes can be accommodated was supported.

RESEARCH ETHICS AND INTEGRITY

As part of the Senate-approved University Research & Innovation Committee (URIC), a Research Ethics and Integrity Committee (REIC) convened in 2014. This committee will address ethical matters related to research.

The following themes will form part of the scope of this committee's activities: (a) Clinical Research, (b) Animal Research, (c) Sustainable Development, (d) Safety and Security, (e) Research with people and vulnerability, (f) Postgraduate Studies, (g) Publications, (h) Stewardship, (i) Law and (j) Corporate Responsibility.

A first meeting of this committee was convened on 8 May 2014. The purpose of this meeting was (i) to discuss the constitution of such a committee and (ii) to discuss a strategy to develop a research ethics and integrity protocol for the University.

Research ethics portrays an institution's and an individual's credibility and integrity in the research process. The assignment of the committee is to:

- a) Draft a Research & Integrity Code of Conduct for the CUT for approval by Senate via the URIC, and
- b) To implement the proposed Code of Conduct.

The second meeting held on 31 July 2014 adopted the above Research & Integrity Code of Conduct for the CUT. The meeting also agreed on the route/system to be followed when approval is sought on research ethics, taking into consideration that the best system for integrity starts at the lowest level. Consideration should be made of the following: (1) Potential research issues that affect the integrity of the system, (2) research issues that cannot be resolved by Faculty Research Committees (FRCs), (3) research issues that can be escalated to the REIC, (4) research issues which are compelled by law to have official approval from the relevant legislated authority.

The URIC will now take this initiative forward to formulate a research and integrity protocol for the University.

INTERNATIONAL COLLABORATION

Prof. Susan Tilley, Professor in Undergraduate and Graduate Studies in the Faculty of Education at Brock University, Canada, visited the University during March 2014. During her visit, she held meetings with the Research Forum.

At this forum she discussed with the Research Managers and staff of the Research Office a protocol for research ethics and integrity.

A number of important pointers for a research and integrity protocol were highlighted, such as the intention of the research, possible benefits and challenges, impact on the research community as well as the public community and the perception that once a proposal is approved, no further ethical engagement is necessary.

An important drive for ethical review is not to shape the research, but to direct the research to be reflective of ethical values.

Prof. Tilley also presented a public lecture to staff and students on respectful research. She highlighted two perspectives that are often omitted in the discussion in research ethics. These perspectives are researcher identity and critical reflexivity. She also discussed the role of situational knowledge, power and cultural background in an ethical debate.

From the presentation it was clear that roles and responsibilities should also be cleared in the research process. An ethical review is not without its benefits. Apart from the educational value, it also provides protection.

People are becoming more sensitive towards confidentiality, vulnerability, risk, harm and ownership of different parts of the research process. The question on who should be authors of a paper was also entertained.

The oversight process is not without its challenges too. Typical challenges will be the instrumentalism of the review process, exaggeration of risk, harm and vulnerability. These challenges call for a strong review committee and proper guidelines to direct the review.

During the lecture and meetings, everyone was in agreement that a broader research ethics discussion is warranted to guide the research community on what the pointers for responsible and respectful research are.

Some pointers are maximum reciprocity, understanding the implications of our identities as researchers and positioning, continuous engagement in critical reflexivity, our position in power relationships, how researchers see themselves, connected across similarities and recognising differences, how a researcher is connected to other people, engagement with critical research praxis and contextual and cultural knowledge (how much time we spend learning).

JOURNAL: *INTERIM* 2014 VOL. 13 NO. 1 & 2

The Faculty of Humanities completed a dedicated edition on research from master's and doctoral dissertations and theses completed during 2013 and 2014. This was published as *INTERIM* 13(1).

The Faculty of Management Sciences completed a dedicated edition on several topics related to Management Sciences. This was published as *INTERIM* 13(2).

SUMMATIVE PROGRESS WITH RESEARCH AND DEVELOPMENT PLAN, 2014-2020

Ten Research Programmes

The progress of the roll-out of the human skills and potential development strategies is outlined below.

Table: Ten Research Programme strategy progress

Activity	Focus	Criteria	Progress
Under-graduate to Graduate Student Programme	To recruit and support BTech/ Hons students to enrol for master's degrees	An institutional Young Scientist Workshop will be held during September. The aim is to take young scientists through all the stages of a research project. Entry requirement: Short study proposal	Draft programme was developed and will be rolled-out in 2015.
Master's Education Programme	10X Part-time Grants (R40 000 per student) 20X Full-time Grants (R70 000 per student) R100 000 conference support for master's degree students	Full-time 1. Tuition 2. Stipend – payout four times a year 3. Project Fees to a maximum of R20 000 4. Duration one year – renewable for one more year based on progress and availability of funds. Must complete study within two years.	Total of thirteen (13) full-time master's students were funded to the value of R685 980 across all four (4) Faculties. (*Five [5] student grants not activated – there was no Acceptance of Condition to the value of R165 990).
		Part-time 1. Tuition 2. Project Fees to a maximum of R20 000 3. Duration one year – renewable for two more years based on progress and availability of funds. Must complete study within three years.	Total of eighteen (18) part-time master's students were funded to the value of R511 170 across all four (4) Faculties.
		Conferences R25 000 per Faculty available for conference attendance for master's degree students. Grant-holders must present at conferences.	Three (3) master's students were funded to the value of R46 190.
Doctoral Education Programme	10X PT (R60 000) 20X FT (R100 000) R100 000 conference support	Full-time 1. Tuition 2. Stipend – payout four times a year 3. Project Fees to a maximum of R30 000 4. Duration one year – renewable for two more years based on progress and availability of funds. Must complete study within two years.	Total of five (5) full-time doctoral students were funded to the value of R358 284 across all four (4) Faculties.
		Part-time 1. Tuition 2. Project Fees to a maximum of R30 000 3. Duration one year – renewable for three more years based on progress and availability of funds. Must complete study within three years.	Total of eleven (11) part-time doctoral students were funded to the value of R394 310 across all four (4) Faculties.
		Conferences R25 000 per Faculty available for conference attendance for doctoral students. Grant-holders must present at conferences.	Five (5) doctoral students were funded to the value R30 000.

Activity	Focus	Criteria	Progress
Next Generation Researchers	Application to DHET Grant (see Appendix 1)	Identified by DHET Grant – will not be funded from the CUT's R&D Grant. NB: This category is for staff without a doctoral degree.	This category will only be rolled-out in 2015 due to the fact that the DHET R&D Grant from which this programme will be funded was only released in October 2014.
Postdoc Fellowship Programme	Track 1: (7X R200 000) FT- postdocs	Track 1 (Full-time) 1. Application via FRC to URIC 2. Renewal based on criteria per policy 3. Must be associated with research clusters and programmes 4. Scholarship /grant – tax implications	Total of five (5) full-time postdoc fellows were funded to the value of R880 000. Four (4) postdocs from Faculty of Health and Environmental Sciences and one (1) from Faculty of Engineering and Information Technology.
	Track 2: (10X R20 000) PT-postdocs (doctoral students who completed studies at the CUT but not working at a university)	Track 2 1. 1 x year award 2. Finalisation of publication 3. Submission of IP/patent 4. Training programme in science writing/supervision practices – contract / commitment to act as supervisor	No applications received.
	Track 3: (20X R30 000) Staff members who completed their doctorates – any university	Track 3 1. 1 x year award 2. Finalisation of publication 3. Submission of IP/patent 4. Training programme in science writing/supervision practices – contract/ commitment to act as supervisor	A total of fifteen (15) staff members who completed DTech/PhD degrees received incentive to a value of R450 000.
Emerging Researcher Programme	20X R20 000 to staff members for 2014	1. Application – three parts: plan for development, research activity & CV 2. Screening by RMs 3. Committee and Peer review 4. Approval by URIC 5. Applications by 15 June 6. Finalisation: end July	Total of five (5) emerging researchers were funded to the value of R100 000. A workshop by Dr Bok Marias on research methodology to assist with Thuthuka applications.
Mid-career Researcher Programme	15X R20 000 to staff members for 2014	1. Application – three parts: plan for development, research activity & CV 2. Screening by RMs 3. Committee and Peer review 4. Approval by URIC 5. Applications by 15 June 6. Finalisation: end July	Total of three (3) mid-career researchers were funded to the value of R60 000. A workshop by Dr Bok Marias on research methodology to assist with Thuthuka applications.
Established Researcher Programme	15X R20 000 to staff members for 2014	1. Application – three parts: plan for development, research activity & CV 2. Screening by RMs 3. Committee and Peer review 4. Approval by URIC 5. Applications by 15 June 6. Finalisation: end July	Total of one (1) established researcher was funded to the value of R20 000. The grant will be used in support of a project in research education.
Focused Researchers Career Programme	R100 000 per Faculty	1. Faculty to deal with awards 2. Consider development of black female staff to move to associate/ professorial level	The grant was transferred to all four (4) Faculties. Six (6) female staff members were awarded the grant to the value of R86 711. The grant was used for mentorship by experts, skills developmental workshops, international visits and conferences.
Rated Researchers Programme	8X R40 000 for Rated Researchers	1. Use for research activities only – no personal incentive 2. Pay-out by end May 2014 into researchers' GLA 3. Annual report by end of 2014 – focus on outputs and sustaining rating	Six rated researchers. Four new applications for 2014 submitted to NRF. Three awards were made. In 2015 CUT will have nine rated researchers.

The following activities in support of the R&D Plan has been funded:

Table: Activities in support of R&D Plan

Category	Focus	Criteria	Progress
Incentive Funding	Can be used by researchers in support of their research activities.	<ol style="list-style-type: none"> 1. Pay-out according to policy 2. Approval May URIC meetings 3. Pay-out by May 2014 4. Strongly advised to use for research purposes 5. Revise policy on personal incentive and staff who left the University 6. Use unspent money to support new applications for rating in 2015 	Money was paid to the individual researchers. The total value per credit was R25 000.
Sabbatical and Mentorship Grants	To support four staff members for 6- or 12-month applications and to make expert support available to draft funding applications, writing proposals, papers, etc. through mentorship programmes.	<ol style="list-style-type: none"> 1. Linked to Grant Agency applications 2. Support programmes for writing proposals and applications 	Two submissions to the NRF. One submission will be funded.
Incentive for completed doctoral studies	Promoters of 15X doctoral degree students. (R20 000 per doctoral study)	<ol style="list-style-type: none"> 1. Pay-out by end May 	A total of twenty-three (23) supervisors or promoters for DTech students received incentive to a value of R320 001.

RESEARCH OUTPUTS AS PER DHET CATEGORY

The table below outlines the progress made on committed research outputs as per DHET category.

Table: Progress on committed research outputs

Category	Committed target	Progress	Comment
Accredited publications outputs	73	>73	Target has been achieved.
Completed master's degrees	40	37	93% of the target has been achieved.
Completed doctoral degrees	10	13	100% of the target has been achieved.

EXTERNAL FUNDING MANAGED BY R&D UNIT

The table below outlines the external sources and amount of funding towards research.

Table: External funding

Agency	Funding	Amount
NRF	Block grants, Thuthuka, Rating Incentives	R 7 600 000
CSIR	Laser rental/access programme	R 351 000
PA & A Malan Trust	Studies in art and project on research education	R 150 000
Total		R 8 101 000



PART 5

Technology and Innovation



From the Director: Technology and Innovation

Prof. G.D. Jordaan

Good progress has been made with the following major challenges addressed by Technology and Innovation during 2014:

- Revitalisation of the CUT incubator
- The roll-out of the Vision 2020 Innovation and Incubation Programme
- Securing the TIA's approval of the TIA Seed Fund agreement and the recruitment of qualifying participants in the Programme
- Expanding the Intellectual Property portfolio of the CUT
- Securing ISO 13485 certification for the CRPM

Both the PDTs and CRPM are financially still in a relatively strong position and functioning at a satisfactory level.

The termination of the national FabLab programme at the end of the 2013/2014 financial year necessitated the funding of the initiative during 2014 by the CUT itself. Special efforts were made to revitalise the incubator. The previous tenants, which were performing very unsatisfactory, were excluded from the initiative and replaced by a new group of seven tenants. The performance of most of these proved to be much better than that of the previous group.

UNIT OF TECHNOLOGY AND INNOVATION

INCUBATOR

Efforts have been made to revive the incubator by the expulsion of the previous group of non-paying tenants and the recruitment of new incubator tenants. All legal processes have been followed and seven new businesses moved into the incubator offices during the course of the year. At least four of these entities are functioning well and meeting all their obligations. In this manner, employment has been created for 19 individuals through ownership of the incubated enterprises, appointments as well as a part-time appointment.

T&I has begun with the launch of an incubator on the Welkom campus as well. For this purpose, Mr Motsoeneng has been redeployed to the Welkom campus. In addition to the incubator, he is also expected to oversee the IP activities as well as interaction with the University Research and Innovation Committee at Welkom.

Fourteen business clinic courses were offered to incubator tenants, Vision 2020 Innovation and Incubation Programme grant holders and a few IT students as well.

Vision 2020 Innovation and Incubation Programme

Four applications for grants in this programme have been approved and good progress has been made with the roll-out of the respective projects. An Innovation Competition has also been offered as an element of this programme.

TIA Seed Fund

TIA's Seed Fund initiative was also rolled out by the T&I Unit and an amount of R1 430 000 has been paid over to the CUT to manage the execution of four projects with this money. Due to a delay in the transfer of such funds, the execution of the projects are currently behind schedule.

Technology Transfer Office

Two applications for IP protection have been formally submitted to the patent office, whilst a further five applications are being prepared by the TTO, with the assistance of patent attorneys, for registration at present. The registration of one application has been discontinued for technical reasons.

Mr Seane, CEO of CSET, has been appointed as a full member of the Intellectual Property Steering Committee, whilst several products have been referred to him for possible commercialisation.

A funding application has been submitted to NIPMO for the appointment of a business development officer. The application was approved and an amount of R1 146 096, as well as a moderate amount for training and administrative expenses, is to be availed over a period of three years. The CUT still needs to enter into a formal agreement with NIPMO to finalise this matter.

A comprehensive booklet titled *Becoming IP Wise* has been developed by the TTO and is used as a guiding document during a short course in IP offered to staff, students and incubator tenants.

Six applications for IP registration, consisting of one final patent, two provisional patents and three design registrations, were submitted.

SEDA AGRICULTURAL AND MINING TOOLING INCUBATOR (SAMTI)

Purpose of Unit

The SAMTI is an element of the Science and Technology Programme of the Small Enterprise Development Agency (Seda).

It is funded by the Department of Trade and Industry and is aimed at the development of an enhanced technical capacity in tool-making, with special emphasis on the agricultural and mining sector.

The Director: Technology and Innovation is a director of the entity and functions as liaison between the CUT and SAMTI.

Report

Several participants of SAMTI graduated from the incubator at the end of 2014.

A water jet cutter of SAMTI, financed to a value of approximately R1 million with a donation from Eskom, has been commissioned and is available for use by the CUT if needed.

This unit has been requested by several regional role-players to extend its services to QwaQwa, Welkom and Kimberley. These possibilities are now being investigated.



Overview

The Centre for Rapid Prototyping and Manufacturing (CRPM) has had a very successful 2014. We exceeded our budgeted turnover by 9% and a number of research initiatives were undertaken on behalf of the Department of Mechanical and Mechatronics Engineering. However, since research is done by the CRPM on behalf of the Department, it is incumbent on the relevant Faculty to report on such.

The commercial value of the 586 industrial projects completed at the CRPM during 2014 was R4 562 838 (see Table below), representing an increase of 20% compared to 2013 (project value of R3 799 172).

Furthermore, a total of R350 530 was financed by the CRPM for 28 research projects compared to R201 485 which was spent on research projects during 2013.



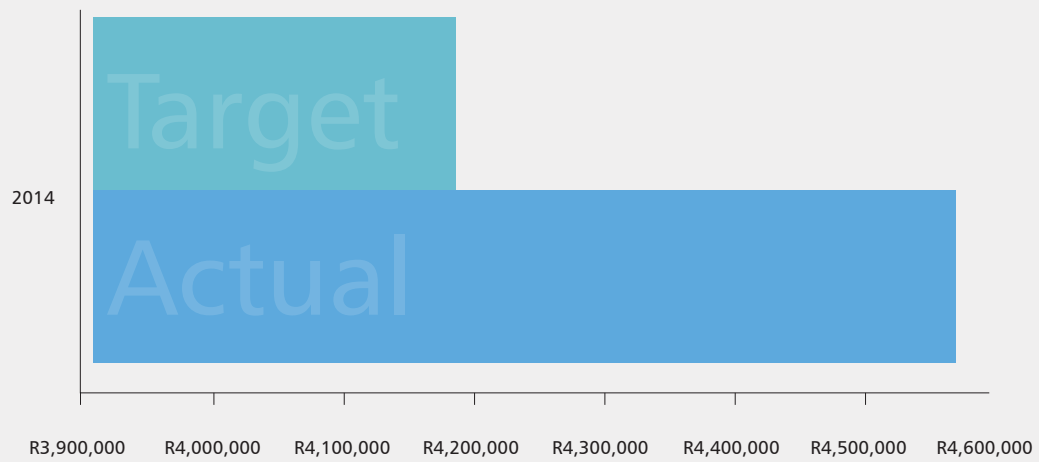
The above images show: i) 3D model of defect, ii) 3D model of custom designed implant, iii) DMLS implant after sterilisation and iv) implant fitted on pre-operational planning model to verify fitment.

Table: Summary of operations for 2014

2014	Number of industry supported projects	Value of industry supported projects	Number of research projects	Value of research projects
Quarter 1	138	R 1 151 590	6	R 76 700
Quarter 2	171	R 1 354 260	10	R 76 925
Quarter 3	139	R 1 015 665	21	R 180 290
Quarter 4	138	R 1 041 323	4	R 16 615
Total 2014	586	R 4 562 838	41	R 350 530

The figures below show the actual accumulated turnover against the budgeted accumulated turnover and the actual monetary monthly values compared to the budgeted amounts.

Summary: Actual vs Target - 2014



2014	
Target	R4,179,100
Actual	R4,562,838

Monthly values of industrial projects - 2014

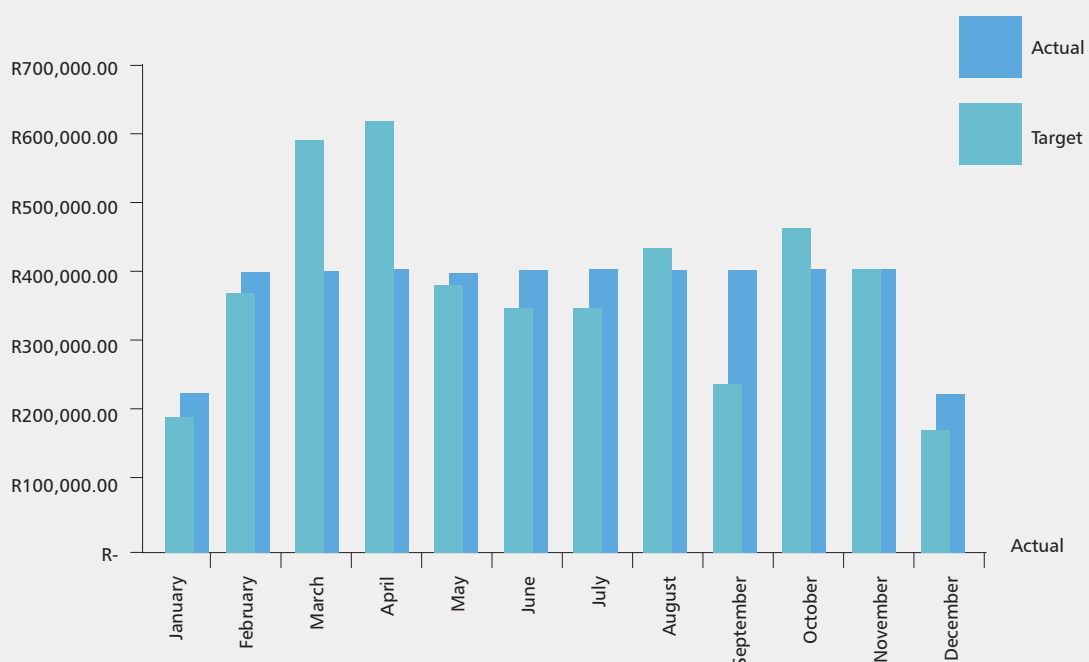


Figure: Summary of turnover – Actual vs. Target Figure: Monthly values of industrial projects: Actual vs. Target

Reaching these targets put a very heavy workload on the staff of the CRPM and is evidence of the very high quality of customer service provided in a time of a high increase in the number of additive manufacturing (AM) machines and service bureaus in the country.

RESULTS FROM COMMUNICATION AND MARKETING EVENTS

The CRPM attended numerous national meetings for projects, research and strategic alignment sessions, namely:

- RAPDASA Exco meetings
- Task Team meeting for the Regional Innovation Forum, Free State (RIFFS)
- Regional Innovation Forum – Science Park meeting
- Toolmakers Association of South Africa (TASA) Free State Launch
- PDTs Strategic session
- Prof. Francis Smit – UFS
- Regional Innovation Forum Seminar, OECD Report
- Further collaboration With TIA(GIZ) – Ms Huester and Mr Cunningham
- Collaborative research: University of Johannesburg – Mr Farouk Varachia, Mr Steven Mavhungu, Prof. Bhero Shepherd

The CRPM was visited by several national and international people from universities, industry and governments, namely:

- Dr George Vicatos and Severin Tenim – UCT
- Prof. Bob Frater – UK; Hans van den Heever and Dr Jordaan – UFS
- Prof. Herbert Frey – Germany
- Thomas du Plooy and Paul Motalane – NLC at CSIR
- Farouk Varachia and researchers – UJ
- Jani du Preez – MUCCP

The CRPM is promoting its services by giving presentations and exhibiting at national trade fairs and shows, namely:

- Prof. Gert van Zyl – Dean of the Medical Faculty at UFS
- Konrad Els – Selective Surgical
- Hano Steyn – Denel Spacetec
- Tembile Kulati – CUT SEU
- Prof. Neil Garrod – CUT
- Collaborative research: University of the Free State – Delegation from the Medical Faculty
- Mr Garth Williams – Director: Advanced Manufacturing Technologies, Department of Science and Technology
- CRPM participated in the annual Winter School initiative, hosted by the Faculty of Engineering and Information Technology
- Chinese delegation visiting CUT
- RAPDASA Industry Open Day

The CRPM exhibited at the following events:

EXHIBITIONS ATTENDED – 2014
Young Entrepreneurs Conference & Expo, Bloemfontein, President Hotel 5-6 June
Bloembou Expo UFS, 23-24 July
Eskom Young Scientists Expo, UFS 14-16 August
AMI Conference Kwa-Maritane, 15-17 October
Propak Cape Town, CTICC 21-23 October
RAPDASA, Stellenbosch 5-7 November

MISCELLANEOUS TASKS PERFORMED BY TECHNOLOGY AND INNOVATION

On request of the DVC: Academic, the Director: Technology and Innovation held talks with the HOD's of Mechanical Engineering and Art during 2013 regarding the possible roll-out of an activity in engineering design sketching.

These talks were concluded successfully and the Departments implemented a pilot programme in sketching for project students in mechanical engineering.

The intention is to continue with the roll-out of this activity to other engineering programmes as well. In addition it was resolved that as from 2014, the FabLab will extend its services to include design sketching opportunities to interested individuals.

HIGHLIGHTS OF THE YEAR

Prof. Igor Yadroitsev joined the Department as research professor on 7 January 2014. His wife, Dr Ina Yadroitsava, travelled with him to South Africa and is presently a postdoctoral fellow at the CUT. They are originally from Belarus and worked at the Ecole Nationale d'Ingénieurs de Saint-Etienne (ENISE) in France for the past nine years. They are experts in the field of metal laser sintering and materials sciences and have published widely. The CRPM is sure to benefit from the extensive knowledge of these two distinguished individuals.

The Advanced Metals Initiative (AMI) is a programme funded by the Department of Science and Technology. The CRPM forms part of the Titanium Centre of Competence network which is a sub-programme in the AMI. The CRPM was awarded R230 000 for this year under the ongoing Titanium Centre of Competence Programme.

The CRPM was successful in three applications (total value of R1 215 000) for Technology Innovation Agency (TIA) seed funding. These projects entails developing, in conjunction with the University of the Free State, polymer and mechanical human heart valves as well as assistive devices for disabled people.

In the Kimberley Hospital Complex, doctors successfully performed the country's first 3-D printed jaw bone implantation. The patient, a 31-year-old man from Kimberley suffering from facial disfigurements

because of a cancer, received a titanium jaw implant. The surgery was headed by Dr Cules van den Heever, extraordinary professor at the CUT, who has extensive experience in prosthetic jaw implantation. He was assisted by Dr Walleed Ikram, head of the Kimberley Hospital Dental Unit, Dr. Kobus Hoek, a maxillofacial surgeon, as well as Drs Philip Johnsson and Riaan Liebenberg, both dentists at the Kimberley Hospital's Dental Department.

The implant serves to fix the facial contour and restore its normal appearance and function. The customised jaw was designed and manufactured on site at the CRPM with titanium powder on an EOS M280 machine to replace the lower jaw. The use of titanium jaw implants is still very new and further research is needed to fully evaluate the long-term outcomes, but the technology sounds promising.

PROGRESS ON OTHER STRATEGIC MATTERS

Mr Gerrie Booysen went on a study visit from 14 to 23 July 2014. He was invited to attend the EOS 25th Anniversary and User's Day as one of EOS key account holders in the world. Furthermore, he visited First Surface Oberflächentechnik GmbH, who specialises in surface finishing of tooling inserts and parts manufactured by DMLS. He received training on newly purchased EOS parameter editor software and had some further discussions with EOS on the CUT's AM machines service contracts and future collaboration.

Dr Cules van den Heever, Mr Booysen and Mr Johan Els were invited speakers at the Mimics Innovation

Conference hosted by Materialise at their headquarters in Leuven, Belgium. Their presentations focused on how Additive Manufacturing (AM) and design can benefit cranio-maxillofacial reconstructions.

Good progress was made on the ISO certification to facilitate the establishment of the CRPM as an accredited manufacturer. The CRPM employed a junior engineer in July 2014 (3-year contract) who is responsible for the ISO certification and risk management of the centre. Delays from the external consultant, as well as the SABs approval to extend the completion date, caused some delay. A breakdown of the progress is shown below:

No.	Success criteria	Comment
1	Document all business processes as a team in accordance with ISO 9001	95% Completed
2	Document all business processes as a team in accordance with ISO 13485	95% Completed
3	Document all Design and Additive Manufacturing Processes in accordance with ISO 13485	90% Completed
4	Review and implement all processes in accordance with ISO 9001	75% Completed
5	Review and implement all processes in accordance with ISO 13485	75% Completed

Since all the CRPM's activities in this regard has been experimental thus far, the CUT still has to decide on an appropriate business model for this activity in order to roll out the technology commercially.

The CRPM applied to the CUT Strategic Execution Unit for funding support for the following:

Support for medical case studies: R100 000

Upgrade of M250 SLM machine: R500 000

TEACHING AND RESEARCH

Research Outputs in Non-subsidised Journals

Els J, Truscott M, Van der Walt JG & Booysen GJ. 2013. Preliminary findings on an investigation into the three most important process parameters that influence laser sintering of Ti64 and validation of a melt pool simulation model. *INTERIM*, Year 12, No 3.

Accredited Papers

Du Plessis A, Slabbert R, Swanepoel LC, Els J, Booysen GJ, Ikram S & Cornelius I. 2014. Three-dimensional model of an Egyptian falcon mummy skeleton. *Rapid Prototyping Journal*, Vol. 21, Issue 5.

Research Outputs in Conference Proceedings

Yadroitsava I, Els J, Booysen G & Yadroitsev I. 2014. Peculiarities of single track formation from ti6al4v alloy at different laser power densities by SLM. RAPDASA 2014 Conference, 3-7 November. (Submitted to SAJIE.)

Presentations as Invited Speakers

Booyesen G. Fifteen years of metal AM research at CUT – A glance back and future outlook. RAPDASA 2014 Conference, 3-7 November.

Van den Heever C & Booysen G. 2014. Current concepts in Maxillofacial Prosthodontics, South African Society of Maxillofacial and Oral Surgeons, Durban.

Posters Presented

Van den Heever JH, Hoogendijk CF, Botha SJP, Jacobs FJ, Booysen G & Els J. 2014. Reconstruction of an extensive midfacial defect using additive manufacturing techniques. Oral and Dentistry & Maxillofacial Prosthetics Symposium, MD Anderson Cancer Center, University of Texas.

Other Conferences and Workshops Presented

Van den Heever C & Booysen G. 2014. Nineteen year follow-up of a patient with congenital arinhia. South African Biomedical Engineering & Technology Conference, Stellenbosch University.

Van den Heever C & Booysen G. 2014. Reconstruction of an extensive midfacial defect using additive manufacturing techniques. South African Biomedical Engineering & Technology Conference, Stellenbosch University.

External Funding Received

The CRPM was successful in an application to the CSIR National Laser Centre under their laser rental programme. A laser of R400 000 is availed for research on the centre's M250 additive manufacturing machine.

These funds enabled the development of operational support devices – both planning devices and implants – to assist with 14 operations during 2014, resulting in extremely positive media coverage for the CUT.

Boards and Committees

Mr GJ Booysen was a member of the Technical Committee of the International Conference of the Rapid Product Development Association of South Africa (RAPDASA 2014).

Mr GJ Booysen served on the management committee of the Rapid Product Development Association of South Africa.

Internal and External Examiners/Moderators for Postgraduate Research

Mr GJ Booysen was co-supervisor and examiner of Mr MFVT Pereira who was awarded an MTech Engineering (Mechanical) degree at the September graduation ceremony. The title of the dissertation reads: *Additive manufacturing of components for in die cavity use, suitable to withstand Aluminium High Pressure Die Casting (HPDC) process conditions*.

Mr GJ Booysen was co-supervisor and examiner of Ms E du Plooy who was awarded an MTech: Design degree at the September graduation ceremony. The title of the dissertation reads: *3-D Computer-aided Design (CAD) and Computer Numerical Control (CNC) milling: An alternative to traditional ceramics master moulding technology*.

Workshops Presented

Mr GJ Booysen organised the RAPDASA pre-conference workshop on medical product development held on 5 November in Stellenbosch.

Furthermore he assisted in organising an Additive Manufacturing (AM) Industry Open Day held at the CSIR on 11 September 2014. Due to the overwhelming response, a larger venue had to be arranged a few days before the event. A total of 122 guests registered on the day. Many sectors of industry expressed a keen interest in the event and government departments, such as the DST and the DTI, were well-represented.

The programme was structured so as to highlight the diverse applications in AM. A total of 18 speakers presented case studies in consumer goods, tooling, foundries, medical implants and prosthetics, and the industrial sectors.

Departmental Research Seminar

The Department hosted its mid-year research seminar on 30 July 2014 in the Japie van Lill Auditorium. The focus of the seminar was to promote research in the Department. Prof. I Yadroitsev and Messrs GJ Booysen,

J Combrinck and J Nsengimana presented the different focus areas of research.

Awards Received

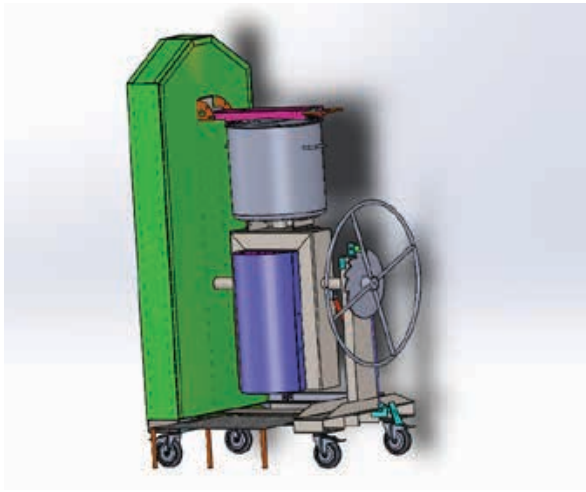
Mr G Booysen was awarded the Vice-Chancellor's award for Innovation for his work on medical implant design and manufacturing through additive manufacturing processes.

Personnel on Editorial Boards or that acted as Reviewers for Peer-reviewed Journals

Mr Gerrie Booysen reviewed one paper for the RAPDASA 2014 annual conference.

PRODUCT DEVELOPMENT TECHNOLOGY STATION

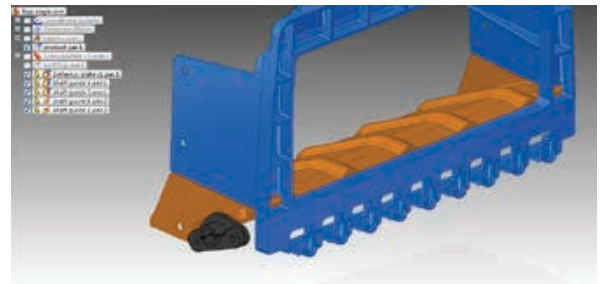
The CAD design:



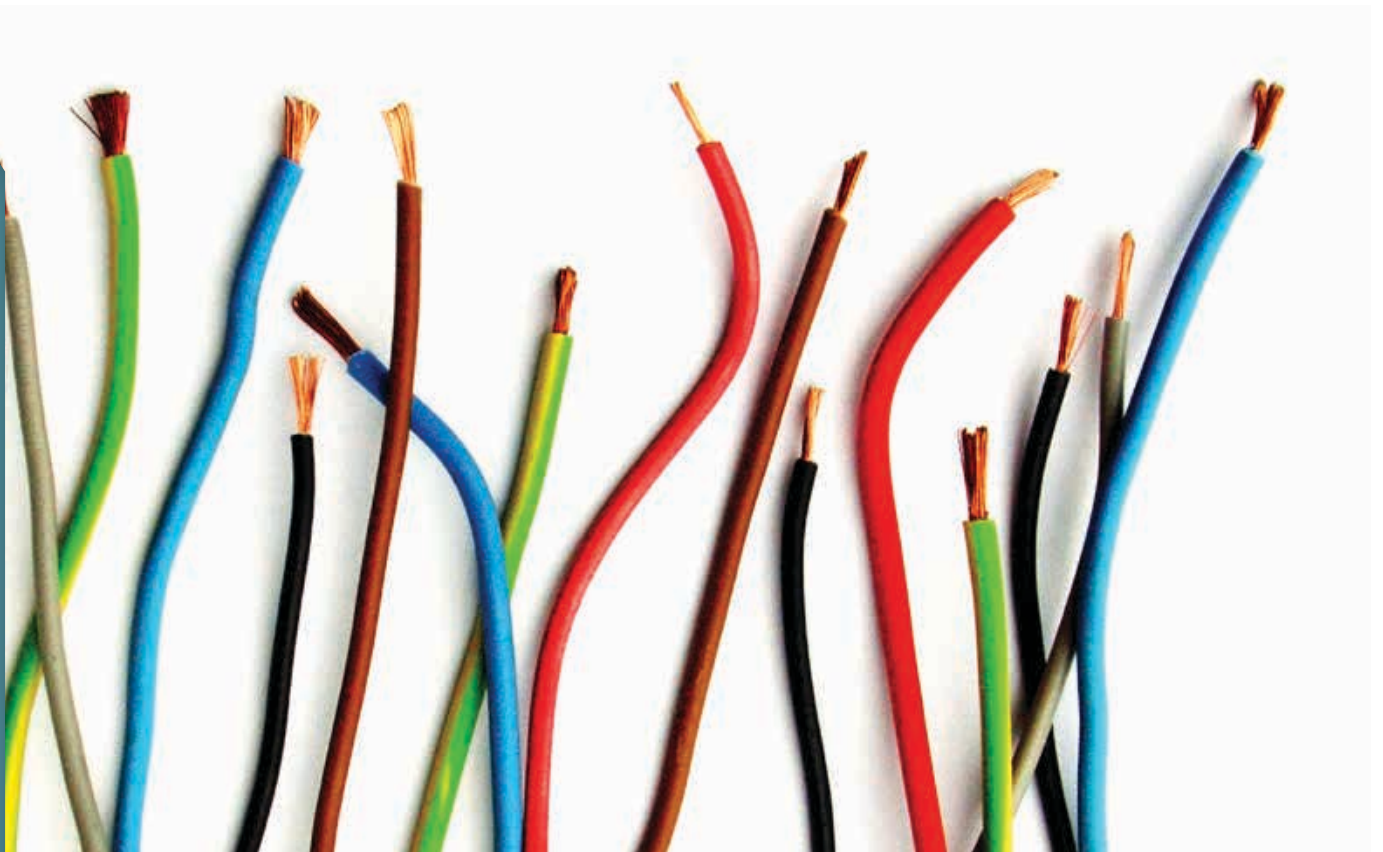
The Final Product:



A scan of a section of the lawnmower body is shown below.



PDTS is functioning well. A number of visitors to the CUT have been exposed to the product development work at the station.



HUMAN RESOURCE DEVELOPMENT

Staff Development: Miralde Kotze wrote the UNISA Marketing Diploma exam.

Personnel: Currently, six P1s, five P2s and nine Interns are employed at the PDTs. They are all CUT graduates/diplomandi and receive continuous training to improve their skills and employability in preparation for their careers in the industry.

Client Contacts

During the third quarter of the 2014/15 Financial Year, the PDTs met with 41 SMEs/individuals on possible projects, as indicated in the table below.

All the proposals that may result in a development project will follow the sequence of steps as laid down in the New Product Development Plan of the PDTs.

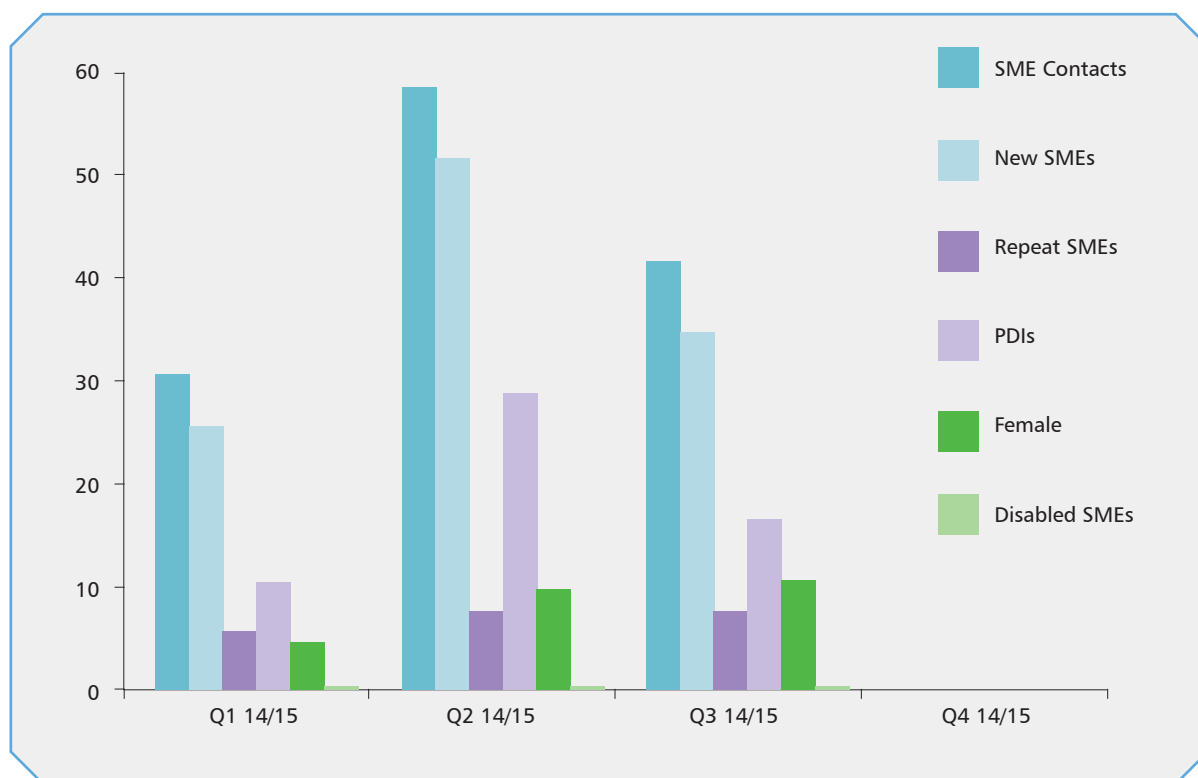


Figure: Number of clients seen

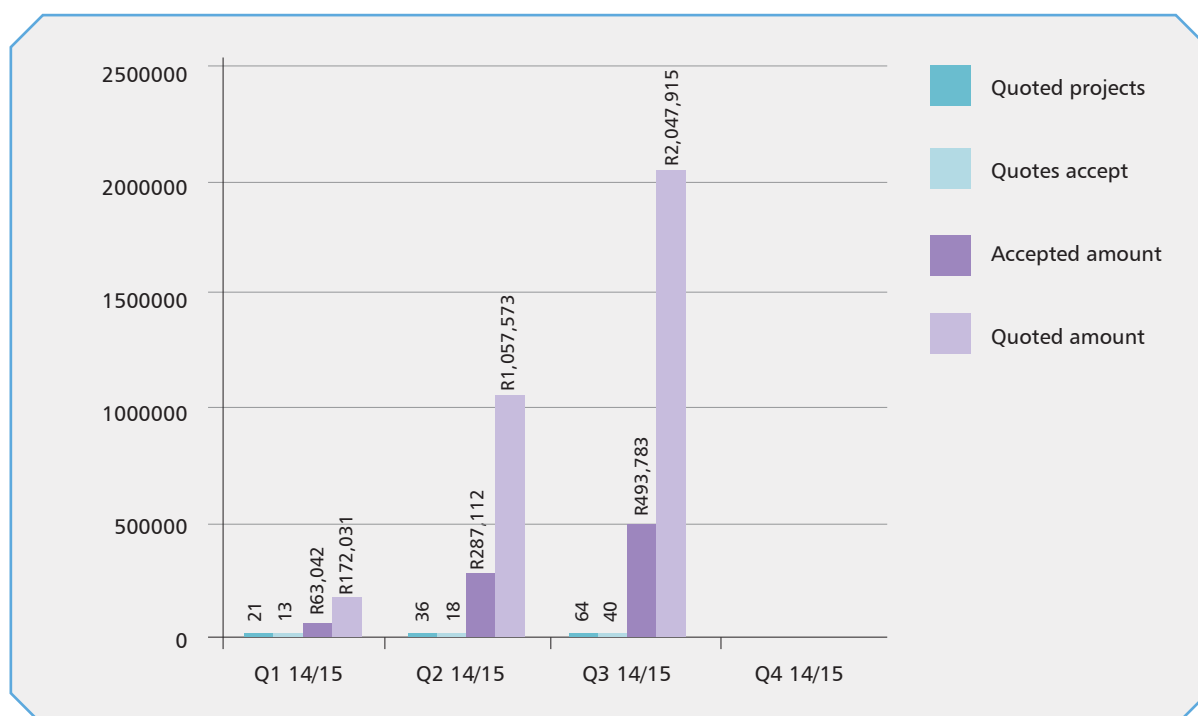


Figure: Summary of quotes issued and accepted

Current Projects

During the period of reporting, PDTs was actively involved in 45 projects, 28 of which were completed during this time. The total number of projects can be categorised into four groups, viz.:

Category	Number of projects
For commercialisation purposes	16
For the customers' own use	26
Research projects	2
Project not to be put to any formal use	1

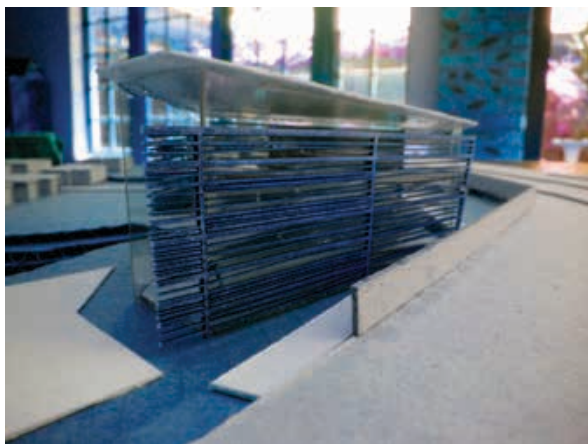
Equipment Usage

Quotes were obtained to evaluate the different arms available. A KREON in France has contacted the station. They offered an arm at approximately R100 000 less than the cheapest one available in South Africa with better specifications. Should Mr Barnard attend the consultant course in Germany, he will also evaluate the arm KREON offer. This is to ensure that the correct equipment is purchased to meet the station's requirements.

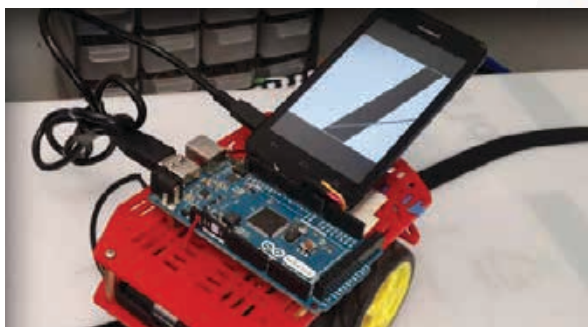
In conclusion, the PDTs has already reached the annual targets set by TIA. Therefore it qualifies to apply for the full payment of the year's grant in one further payment.

FABLAB

Model of a Soccer Stadium



Cell Phone-Guided Two-wheeled Automatic Guided Vehicle



Purpose of the FabLab

The CUT FabLab is currently in its ninth year of operation since its official opening on 23 October 2006. Since the DST decided to terminate the national FabLab programme, CUT financed this entity as from April 2014.

FabLab User Summary

The FabLab receives a large number of users in a seasonal manner, depending on the academic calendar and due dates for the completion of academic projects.

The following table shows a typical distribution of FabLab users:

School Learners	15%
CUT Students	70%
UFS Students	10%
Private Individuals / Entrepreneurs	5%

A learner of Jim Fouché High School in Bloemfontein won a gold medal at the National Expo for Young Scientists with a project that he built at the FabLab.

FabLab Staff

Mr D du Preez resigned as the manager of the FabLab, whilst Mr. Julian Mokoma found employment at General Electric. Hence, Mr Africa Dintwe and Mr Gustav Barnard were assistants in the FabLab for most of the 2014 calendar year. Both assistants have a great passion for working in the FabLab and assisting FabLab users with their various projects.



FabLab Users and Projects

The following is indicative of users of the Bloemfontein FabLab and the nature of some projects that they fabricated:

School Learners	CUT Students
Control drive system for a model vehicle Wooden trays Earrings	Earrings T-shirt painting Light box for tracing pictures Display stands Electronic devices Models of buildings, roads and bridges Arduino home automation controller Greenhouse temperature control models Motorised model cars Watt meters Line follower robot vehicles Obstacle avoidance vehicles LED display matrices Two-way laser communication unit 3-D printed tracker ball holders 3-D printed gear and cam components Engraved plaques Teaching aids and toys for children
Architectural Students of UFS	
Model houses Model of a sports stadium Architectural bridges Abstract concept models	
Entrepreneurs	
Acrylic laser cut memorabilia and decorative items 3-D printed enclosure Engraved torches Engraved leather accessories	

The Bloemfontein FabLab personnel worked on the following projects:

LED bed light
Line follower toy car
Mechanical clock
Corporate gifts
Coin detector / identifier
3-D chess set
Ultrasonic obstacle avoidance vehicle
3-D printed shield for infrared LED pairs
"Blink it" light and image projector

RECOMMENDATION:

It is particularly important to note that there has been a clear change in the main category of FabLab user from school learners to higher education students.

PART 6

Regional Innovation Forum



regional
innovation forum
free state

creating tomorrow

Meetings

A number of Steering Committee meetings of the Regional Innovation Forum were held during which progress reports were tabled and operational, and 3-year rolling plans submitted. Feedback was provided on the inaugural and consequent meetings of the various task teams and the appointment of respective task team coordinators after which opportunities were afforded to provide the meeting with respective plans and strategies going forward.

Contracts, Agreements and Expenditures

The contractual agreements relating to the RIFFS 2014-2016 grant were finalised by the DST's legal section and PHI Attorneys. All legal queries have been accommodated and the contract has been couriered to the Office of the DVC: Academic and Research at the CUT for signature. A financial report was submitted by RIFFS by 18 August 2014 delineating the utilisation as per the approved budget, in particular utilisation of the current R470 000 in the DST1 account. This has been received and approved by DST in a letter from Me Sunita Kalan, Director: Sector and Local Innovation at the Department of Science and Technology. A projected budget for the remaining expenditures running up to the end of the 2014 financial term (end March 2015) was shared with the Dean: Research and Innovation, and indicates the exhaustion of the funds at the mentioned date as agreed. The allocation of the 2nd round of funding from the DST or an alternative funder is imperative for the renewed activities of RIFFS beyond April 2015.

A separate activity, namely the SLA between the UFS and the CUT regulating collaboration toward the Free State Science Park feasibility study, has been concluded with an invoice submitted to the UFS for payment into the CUT's DST1A account.

On request from the DST, a comprehensive business plan was composed for the RIFFS, according to a standard template provided by the DST, for consideration together with the contract between the DST and the CUT. The first draft of the business plan was completed end October 2014 and submitted to the DST for input; feedback was received shortly thereafter from Mr Johann Strauss and Me Sunita

Kalan and these were implemented and resubmitted to the DST at the end of November 2014 – feedback on the latter is still awaited, together with the final signing of the mutually agreed contract.

Strategic Projects

Free State Science and Technology Park (Fuama Village): The recommendations contained in the Free State Science Park Feasibility Study and Business plan were discussed in the mentioned Steering Committee meeting and the committee resolved that recommendation number 13 ("The Board of Directors to apply for General Budget Support [GBS] funds via National Treasury, together with the Free State Provincial Government") should be prioritised in view of the due date of 30 June 2014. The remaining recommendations of the feasibility report, as resolved, will be attended to during the course of the next three years. A first step was to convene a meeting with the Free State Department of Economic Development, Tourism and Environmental Affairs (DETEA) to initiate a joint application for funding from the Free State Treasury – this was convened on 4 June with Mr Seleke, HOD of Free State Economic Development at DETEA offices in Markgraaff Street, Bloemfontein. The meeting was attended by a delegation of representatives from the CUT, the UFS and the DST, led by Mr Johann Strauss. In attendance was, from DST, Mr Isaac Maredi (Chief Director Sectors Innovation and Green Economy), Ms Sunita Kalan (Director: Sectors and Local Innovation) and Mr Johann Strauss (Deputy Director: Sectors and Local Innovation); from CUT Prof. Ryk Lues (Convenor of the Regional Innovation Forum) and Ms Zelda Uwah (Sustainability and RIFFS TT convener) and, from the UFS, Mr Werner Nel (Technology Transfer Office). Mr Chain Sani was identified as the contact person from DETEA for this initiative. After feedback was received from the National and Provincial Treasury that they will only accept new submissions under the Science Park programme for the 2015 financial period, it was decided to utilise the remainder of the 2014 term towards collecting additional information from the region regarding the Science Park; this may be financially supported by the DST. DETEA undertook to table the matter of funding for the Fuama Science and Innovation Park on the agenda of their Executive Management Team (EMT) for further discussion. Approaching alternative funding agencies and sources towards realising the Science Park endeavours from sources such as Horizon 2020, Inyathelo, Research



Africa, the European Union, the DTI and China has also been considered. The key recommendations, which were well accepted by the participants as well as the DST included: (1) RIFFS will commence with discussions with stakeholders into partnering with, and appropriating funding towards, realising the innovation and science park; (2) RIFFS will initiate a process for the establishment of a regional innovation and science park, (Fuama Park) governing body; and (3) the governing body will initiate further activities towards the establishment of a regional innovation and science park which includes the securing of funding via, amongst others, a submission to DETEA and the Free State Treasury. An updated progress report and suggested way forward was submitted at the end of 2014 to the CUT executive, which proposed as follows:

It is recommended that the Fuama Village entity initially commence with two main components: One at the CUT main campus and the other at the UFS main campus. However, the two entities, as well as future ones to be incorporated into the park, should be governed by a single governing body observing the interests of the UFS and the CUT, as well as incorporating local government and business.

The CUT entity (predominantly realising the “innovation” part of the Fuama Village nomenclature) will primarily focus on SMME incubation, design, manufacturing, skills and awareness development and technology transfer.

The UFS entity (predominantly realising the “science” part of the Fuama Village nomenclature) will focus on commercialised research and analytics, knowledge transfer, co-tenancy and enterprise development.

Based on further inputs from the CUT management, as well as the Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)(Miss Gadija Brown in particular), the future format and implementation plan will be adjusted accordingly.

CUT Design School: The concept of a design school at the CUT is informed by, amongst others, visits to HEI’s nationally and abroad. Funding was set aside under the strategic budget to conduct a feasibility study during 2014. The CUT’s Department of Design and Studio Art and the Office for Technology and Innovation are identified as facilitators. A workgroup was formed, incorporating RIFFS, and a number of meetings will be held to implement the requirements of the grant. It is decided that a seminar be held, drawing on national expertise, after which a recommendation will be made as to the best way forward. A follow-up application was submitted to the strategic fund to facilitate activities during 2015 and the mentioned seminar was held on 12 November 2014. A progress report and way forward was submitted to the DVC: Academic and Research for consideration and implementation, utilising the mentioned strategic funds if granted, at the end of 2014. The initial theme provided to speakers invited to the seminar was as follows: A design school at the CUT should fill a clear need in terms of the completion of the innovation chain, especially with regard to the conceptualisation, invention, design, redesign, prototyping and manufacturing of components. The design entity will, amongst others, utilise both applied art and applied science to establish and/or improve the aesthetics, design, ergonomics, functionality, and/or usability of product, and may

be used to improve marketability and production. Resources/services that may be contemplated as part of the design entity include planning, blueprinting, drawing, mapping, plotting, depicting, modelling and prototyping. In order to draw on artistic input, the CUT design entity may encompass a wider art component towards including, amongst others, the following components: (1) A unit/section for engineering design (functionality or utility of products); (2) a unit/section for industrial design (aesthetic and user-interface aspects of products); (3) a unit/section for artistic design (ensuring the progression from art that stems from a view or opinion or feeling that the artist holds within him- or herself, to design that aims not to invent, but to communicate something that already exists, for a specific purpose); and (4) a unit for innovation and business design (optimising business principles and viability).

Key conclusions: The following main conclusions were reached after much deliberation around various topics as alluded to by the speakers (verbatim available upon request):

- The proximity of design entities to other feeder-disciplines is very important as it is an important prerequisite towards ensuring momentum and integration of ideas.
- Sustained collaboration with national design initiatives at other HEI’s should be maintained. Engagement with the University of the Free State Architecture Department was recommended.
- The augmentation of existing entities such as PDTs with industrial design elements should be considered as an initial step by focusing on product development and improvement.
- The above recommendation should be supported with the appointment of industrial designers in PDTs and CRPM.
- Design should be included in research methodology and other curricula in both the natural and social sciences.
- Research topics in postgraduate research should incorporate aspects of contemporary design in the SET fields, but also acknowledge the links between social sciences and design in themes such as interaction design, sustainability design, participatory design and behavioural design.
- Recognition and involvement of artistic in- and outputs.
- The establishment of training and skills development programmes into, initially, industrial design via short learning programmes as well as post-diploma/graduate offerings (e.g. Master’s Degree in Design [1-year] or Advanced Diploma, BTech, MTech and DTech qualifications in Advanced Manufacturing; short courses in Packaging Design and Industrial Design, etc.).

CUT-ILO Innovation and Manufacturing Hub (with support from the Office for Technology and Innovation): A letter of agreement has been prepared for consideration by the CUT in order to appropriate available facilities to accommodate on the CUT campus the establishment of a CUT Innovation and Manufacturing Hub. Initially, the initiative started as a business case document for the co-location of the CUT and ILO on the main campus as well as the



establishment of a DTI incubator with support from the ILO. The Hub consequently culminated into a joint initiative among key stakeholders in the Free State, including, among others, the CUT, the International Labour Organization (ILO) and the Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTE). The Hub is envisaged to house the Technology and Innovation Office (T&I), Community Engagement, RIFFS, offices of the ILO, SAMTI and eventually PDTs. It will take advantage of the synergies among the University and the members of the Regional Innovation Forum to simulate innovation and entrepreneurship in the Free State. The Hub will encourage young people to design, develop and commercialise innovative business ideas and to gain better access to information and networking opportunities through the collaborative partnership. The ILO and DESTE have formally undertaken to contribute to initiatives that support government's objectives to create employment, particularly among the youth. In this regard, the ILO has initiated discussions with the CUT to contribute to the establishment of the Hub through its expertise in raising funds for projects that have their foundations in social dialogue and inclusiveness. The ILO itself has already received funding from the Flemish government to support its Sustainable Enterprise Development Facility for South Africa project, which will contribute grant funding and other support to entrepreneurs identified through its highly successful enterPRIZE Challenge business plan competition.

In the Hub, stakeholders can jointly create awareness about innovation and its rewards, and assemble and engage innovation stakeholders from various sectors with a view to creating networks and facilitating collaboration amongst academia, industry, government and others. Specifically, the RIFFS (under custodianship of the CUT) supports existing and emerging SMMEs, formal and informal industry, government, academia and the broader community through the facilitation of networking, appropriation of human, financial

and physical resources and skills, and leveraging of infrastructure and finance. T&I is involved in the design and development of innovative products on behalf of private individuals as well as business and industry through the PDTs and SAMTI, managing the CUT incubator and overseeing the intellectual property protection activities of the CUT. Likewise, the ILO provides funding, capacity development, training and networking opportunities through its existing partnerships with the Flemish government, private sector and South African government. It also has a wealth of information and knowledge to share relating to international programmes and best practice, which will contribute to a more vibrant community of entrepreneurs in the Free State. The main aims of the letter of agreement are to:

- Present a backdrop to the relevance of the collaboration and co-location as well as provide a synopsis of the economic challenges facing the Free State region.
- Propose that the collaboration be formalised through the physical co-location of partners in an appropriate locality on the CUT campus where activities relating to innovation and entrepreneurship can be effectively coordinated and managed.
- Provide information on suggested collaborative projects that may flow from the CUT-ILO partnership. These include, for example, operating principles of incubators and other initiatives in order to provide assurance as to proper management and accountability. Governance structures specifying suggested line functions, management and resources will be further aligned once the co-location is in place.
- Provide the motivation and recommendations to identify a building and infrastructure to house the Hub on the CUT campus with the co-location partners.

- To duly plan for the phased development of an extended Innovation and Manufacturing facility, incorporating an incubator housing high-tech tenants, as well as buildings to house PDTs and SAMTI.

The ultimate aim will be to use the partnership between stakeholder entities at the CUT and ILO as a platform and “address” to attract additional funding and support to the CUT and associated stakeholders, either through the Department of Science and Technology (DST), the Department of Trade and Industry (DTI) and independent external sponsors. The ILO has committed to assist the CUT in raising these funds through the DTI’s Incubator Programme, or other such programmes that may be deemed appropriate.

Funds raised through these entities will contribute to the upgrade and customisation of the building to meet the needs of beneficiaries such as SMMEs, incubatees and other co-location partners. Apart from running usual management and administrative activities under the various stakeholder offices (ILO, RIFFS, T&I, SAMTI, PDTs and other tenants), initial projects to run under the collaborative partnership include:

- Continuation of the master caterers and enterPRIZE challenges
- Implementation of the design, brewing and green building challenges
- Application for a DTI-CUT incubator in collaboration with the ILO and DTI’s ISP Programme
- Hosting of events, e.g. the Welkom Free State challenge and comparisons with Dortmund, Germany
- Supporting contract R&D initiatives such as DRAC and an OVK-CUT product development centre

TASK TEAM ACTIVITIES

Two formal meetings of the Operational Team (consisting of the regional coordinator, task team chairs and secretariat) were held in addition to a number of bilateral meetings into specific task team projects between the regional coordinator, task team members, external stakeholders and service providers.

Team Awareness

Branding and Marketing: A branding pitch was delivered by SilverRocket and the committee made a number of comments on, amongst others, the logo and slogan. It was resolved that further suggestions be submitted by means of a round-robin process finalised by 10 June 2014. Following a number of discussions amongst the RIFFS members and service provider, the branding was approved.

In terms of promotion and marketing, a comprehensive advertorial was placed in the June 2014 edition of the Free State Bulletin publication which reaches a wide readership.

Events: During the week of 17 March 2014, Me Jaana Puukka, main author on the OECD report on the role of Higher Education in Regional and City Development in the Free State, visited the CUT. On Wednesday 19 March a symposium was facilitated by the Regional Innovation Forum to discuss developments in the Free

State socio-economic landscape after the OECD survey published in 2012 as well as the role of entrepreneurial education in the larger innovation value chain. The event also saw the official handover of the Science and Innovation Park Feasibility Study by the UFS to the DST. A number of relevant suggestions and resolutions were drafted at the event that will be followed up by RIFFS and other stakeholders in 2015. Another valuable outcome of the events is the collaboration and networking opportunities created via the authoritative and diverse contributors to the programme. A much better understanding of the challenges of the various stakeholders and scope for further engagement was also created.

- The RIFFS, by means of the input of Dr Hanita Swanepoel and Mrs Zelda Uwah in particular, facilitated and partook actively by means of contributions to the formal programme, judging and appropriating resources toward the CUT-OVK product development competition held on 30 August 2014 in the CUT Hotel School.
- In collaboration with the ILO, DESTE and the CUT Hotel School, RIFFS partook in the planning (late 2014), launch and implementation of the Free State Master Caterers Challenge 2015 under the umbrella of the Free State enterPRIZE Job Creation Challenge. DESTE and the ILO in partnership with the CUT, Flanders, Standard Bank and FICA, held the official launch of the 2015 Free State Master challenge on Wednesday 21 January 2015 in Bloemfontein at the CUT’s Hotel School atrium. The event was attended by, amongst others, the Free State Premier, Mr Ace Magashule, and a number of MECs including the MEC for Economic, Small Business Development, Tourism and Environmental Affairs, Mr Mosibenzi Zwane. Apart from the CUT’s involvement by means of training, events management and in-kind appropriation of facilities, it was also represented by RIFFS via contributions to the formal programme. The Assessment and closing events are planned for March 2015.
- Barclays has partnered with the British Library to host live on-line webinars featuring well-known entrepreneurs/business persons who share thought leadership on various topics relevant to our enterprise market. The format is one main live event in London (usually attended by approximately 250 entrepreneurs) with linked in live screening occurring across the rest of the United Kingdom and worldwide. Live audiences in the United Kingdom pose questions from the floor whereas remote screenings engage via Twitter and Text. Mr Jerome Crowder, ABSA Regional Manager Central Region – Enterprise Development engaged the RIFFS to host one of the British Library live screening events that form part of Barclays’ ‘Inspiring Entrepreneurs’ drive. The event was held at the Japie van Lill Auditorium at the CUT on 17 November 2014. ABSA sponsored the refreshments for the event and engaged CUT Marketing and Communications for media coverage and marketing. Attendance for the event was by invitation as distributed electronically by Barclays UK. RIFFS also submitted a guest list on behalf of the CUT and its external partners. Speakers at the webinar included Sir Charles Dunstone, Me Anya Hindmarsh, Kanya King and Mr Tom Pellereau. The event was well

attended and responses during the Q&A session afterward, chaired by Mr Crowder, was energetic and participative.

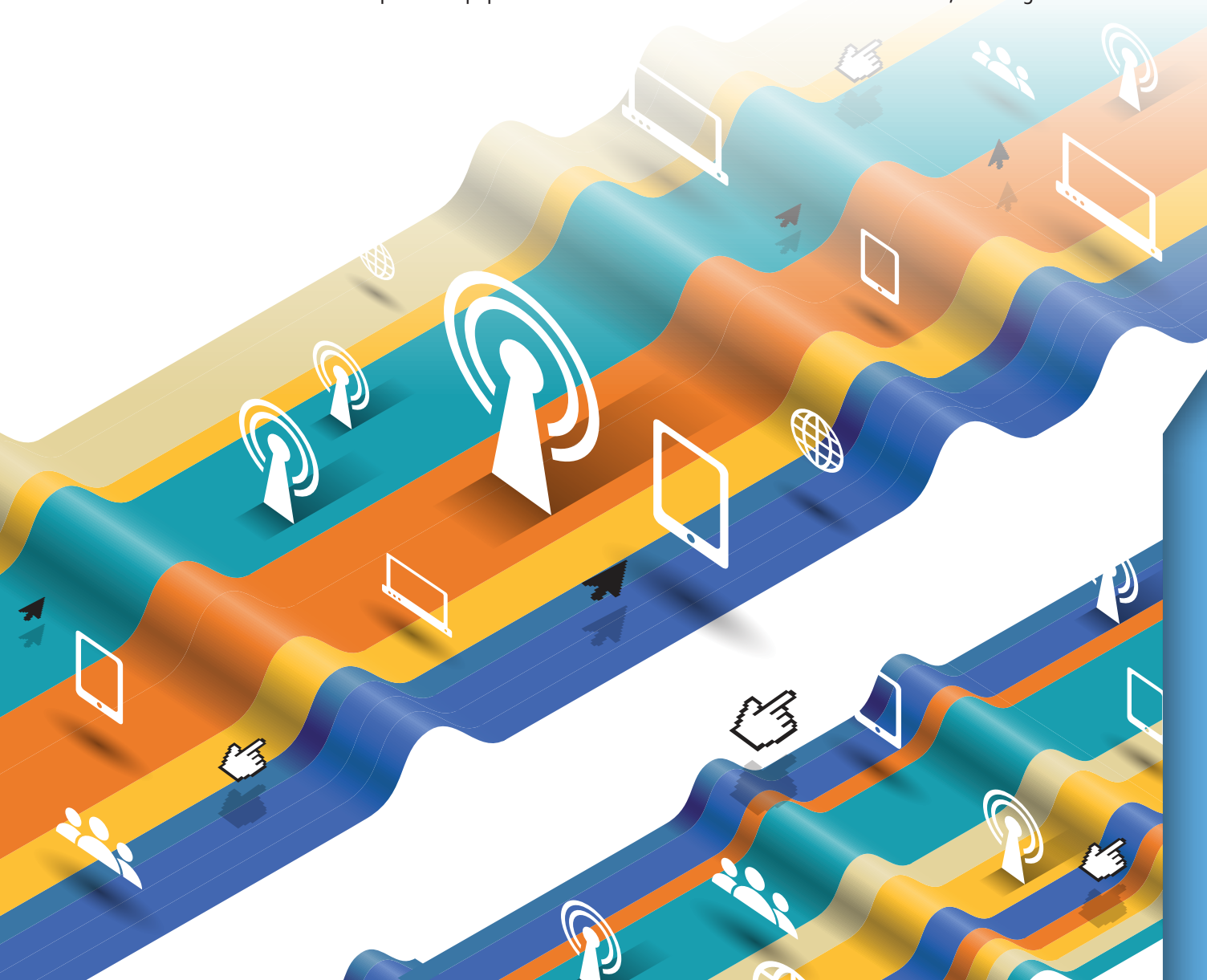
- RIFFS is partnering with the UFS Business School in the TIA Entrepreneurship and Business Development Programme. The initial planning for the intensive five-week course started late 2014 for roll-out during March 2015. The purpose of the programme is for attendees to be able to outline the key steps in the entrepreneurial process that turns an idea into a business start up, and to develop and execute a sound business plan which takes into account all the critical aspects of the business and to receive the opportunity to present innovations and business plans to potential funders in order to obtain financing. The 10 best delegates nationally will be selected to attend a five-day entrepreneurship workshop in Switzerland, sponsored by the Swiss South African Joint Research Programme. The course was marketed amongst all CUT faculties and the CUT enrolled 11 candidates from a variety of disciplines for the course.
- RIFFS sponsored all its task team leaders as well as two CUT staff to attend the 2014 Innovation Summit held in Cape Town during September 2014.
- The RIFFS coordinator visited a number of Science Parks and Innovation centres in Denmark, during a combination visit to present a paper at the ICFMH

Conference in Nantes, France. Entities visited and collaborations forged include the COBIS Science Park, Aalborg University and University of Denmark Innovation entities.

Team Brainwave

Innovatorium: The task team previously named "Pitching Den and Incubation" was renamed to coincide with the terminology utilised by the predominant activities residing at the University of the Free State with assistance by Mr Johnathan Smit. Also, a need was voiced for an activity that precedes the idea-start concept, namely introduction of a student organisation that utilises individuals from both the social (business) and SET spheres to confront and dissect innovative pitches (labeled "Innovatorium"). This has also seen the moving of the task team coordinator, Mr Smit, to the Western Cape opening up the need for a replacement, which was consequently taken up by Dr Hanita Swanepoel of the CUT. The reorganisation of this task team contemplated the moving of this entity to the Resources task team, but it was later decided to maintain the financial and human resources components under this entity as the latter has encapsulated the financial and business components more effectively.

Slingshot: The principle of idea and patent mining at academic and other levels was deemed to resort under this task team. Exploratory discussions with the CUT student association *Enactus*, under guidance of



Prof. Crispin Chipunza, and how to integrate their innovation-related activities with those of the UFS Idea-Start programme, were held. During various meetings it was reiterated that RIFFS should initiate engagements with research and development sections at the CUT and the UFS to ensure that research activities are aligned with the forum's endeavours and vice versa. As an initial project RIFFS, in partnership with the UFS Postgraduate School, initiated a strategy in November 2014 to jointly present a workshop on enhancing research outputs through innovative thinking, to be presented on 20 February 2015. The main presenter, Prof. Benjamin Anderson, is well-known as a member of the CHE council, previously from FirstRand and now the Chief Executive Officer: The Da Vinci Institute for Technology Management in South Africa. There will also be a guest presentation by a well-known Free State entrepreneur, Mr Kgosi Ntono, award-winning Free State entrepreneur and owner of King Studios. The role of RIFFS in this project lies in its mandate to create platforms to advance innovation – one being the mobilisation of research outputs into patents and enterprises.

Apart from RIFFS' involvement, the UFS is keen to collaborate wider with the CUT's research and postgraduate entities and is thus hoped that collaboration in terms of research and postgraduate studies between the two universities will be enhanced via this event. The event should bear minimal financial implication to the CUT as RIFFS and UFS PGS will jointly cover the expenses, attendance is free of charge and there are 60 available seats on a first come first serve basis – irrespective of institution.

Team Solution Exchange

A number of meetings were held with the designated service providers (RPC and SilverRocket) towards the establishment and streamlining of the Solution Exchange web-platform. It was resolved that the website will contain various levels reflecting the

activities of each task team with the primary website incorporating the fundamental RIFFS branding and objectives. Regarding the solution-exchange team, it was recommended that the following units are accommodated: (1) task team overview, (2) an idea/project/innovation posting page, (3) a request for proposals/solution page, and (4) a needs/challenges pinboard/blog. Although it was envisaged that the site will be up and running towards the end of August 2014, the launching has been postponed to March 2015 due to the transfer of the landing page development to the service provider RPC.

MISCELLANEOUS LIAISON AND COLLABORATION INITIATED TOWARD END 2014

- Members of RIFFS have had formal and informal engagements with, amongst others, the DST, OVK, *Enactus* CUT, UFS Office of Technology and Innovation, financial institutions and members of local government and the HEI's in the region into various issues related to innovation and entrepreneurship. New contacts forged with Ms Valerie Flanagan and Ms Winnie Sereeco (ILO), Ms Gadisa Brown (DESTE) and Mr Osman (Director: FDC) have proven particularly lucrative.
- Contact with stakeholders from Matjhabeng Municipality as well as Frank Waeltring (Mesopartner Germany) and Dr Shawn Cunningham (Mesopartner: UK) towards arranging a workshop to compare development in Dortmund, Germany. CUT's Welkom Campus local government and business chambers will also be contacted.
- Engagements with Sam Mashinini, MEC of Public Works and Chairperson of FSPG Economic Cluster via the Master Caterers Challenge and science park initiatives.



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