

RESEARCH AND INNOVATION REPORT 2016



2016

Acknowledgments

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RESPONSES TO RESEARCH DEVELOPMENT AND POSTGRADUATE STUDIES - 2016

PART 1

Foreword from the Vice-Chancellor and Principal

Consistent with the higher education imperatives, our university needs to be responsive to the current socio-economic challenges, especially within the communities that we serve. These imperatives have as a consequence influenced the university towards intensification of the research and innovation agenda. The commitment is further demonstrated in our vision that by 2020, the CUT will be a centre of knowledge, innovation and excellence, producing a critical mass of innovators that contribute directly to prosperity creation.

In 2016, commitment to ensuring unreserved focus on research and innovation resulted in the strategic decision to establish a separate research and innovation portfolio.

Our steady increase in financial investment towards research and innovation has contributed to an increasing trend in research outputs and a steady growth in the academic development of staff members, 32% of whom hold doctoral degrees – justifiable evidence of commitment to the research agenda.

In 2016 we were privileged to have our emerging researcher's also recognised by awards the annual National Women in Science Awards (WISA) for innovative tool that can accurately predict drought-stricken environments for the farming sector and Winner of Tata Fellowship Programme and Special Award Women in Science Awards.

We were also delighted by the numerous collaborations which were undertaken nationally, continentally and globally. Of great significance is a regional collaboration between our University, through the Centre for Rapid Prototyping and Manufacturing (CRPM) and the SARCHi chair in Additive Manufacturing for Medical Devices,

and the University of Free State (UFS). This collaboration embarked on a new innovation that will provide and advance universal access to cardiac surgical services mainly in Africa but also for the world in general – thus improving the livelihoods and quality of life of ordinary community members.

The significant achievements reflected in our research and innovation report are contributions from our unsung champions, our partners and collaborators, our communities and the work of our remarkable research and support staff.

Vision Statement 2020:

By 2020, the Central University of Technology, Free State shall be an engaged university that focuses on producing quality social and technological innovations for socio-economic development, primarily in the Central Region of South Africa.



Prof. Henk de Jager
Vice-Chancellor and Principal





Message from the Acting Deputy Vice-Chancellor Research, Innovation and Engagement

The University's quest for research and innovation impact is outlined in the Research and Development and the Technology and Innovation Strategic Plans, 2014–2020, aimed at contributing towards engagement, innovation, socio-economic development, entrepreneurship and sustainability. The plans are dedicated to creating a research culture and strengthening partnerships with stakeholders to maximise on research outcomes.

It is against this background that in 2016 the university adopted a research and innovation organisational structure by repositioning and strengthening the Research, Innovation and Engagement portfolio through the establishment of the Research Development and Postgraduate Studies Department and appointment of Assistant Deans: RIE within Faculties. Structural processes and institutional strategic transformation of educational programmes also contributed to a shift away from discipline-driven research to multi-, inter- and transdisciplinary research. In addition, most of the research was undertaken under organised research clusters and associated research programmes common to many research systems.

During 2016, we have seen our university continuing to reflect a steady increase in its overall research performance, including research training, research outputs, technology transfer and commercialisation of research outcomes. Over the years we have also witnessed an increase in financial investment into research and innovation. The investment has translated into a 22% growth in publication outputs in 2016 compared to the previous year.

Currently close to 32% of our staff members have doctorates, and during the year under review a total of 79 staff members were supported in improving their qualifications – an opportunity to grow the research outputs dramatically with the increase of staff participating in research.

Numerous research and innovation collaborations were formed both regionally and internationally, with possibly the most significant one being the regional collaboration with the University of the Free State through the Centre for Rapid Prototyping and Manufacturing in the medical field, advancing universal access to cardiac surgical services and thereby improving on quality of life.

As a university we are highly indebted to our researchers, support staff, and stakeholders in carrying out this role, and we will continue to be committed to providing excellence in research and innovation!



Prof. Alfred Ngowi
Deputy Vice-Chancellor:
Research, Innovation and
Engagement (Acting)





RESEARCH INSTITUTIONAL PERFORMANCE HIGHLIGHTS AND ACHIEVEMENTS

PART 2

Research and Development Plan 2014-2020

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

Research and Development Plan 2014-2020 was approved by Senate in August 2013 in support of Research and Innovation strategies towards the fulfilment of Vision 2020's committed research and innovation outputs.

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 **objectives** of this plan are to:

- Grow "seniority" of academic staff profile.
- Grow publication profile – 75% of DHET Norm of 1.1 credit unit per Full Time academic staff.
- Grow postgraduate enrolment – 5% of student body.
- Grow number of completed Masters - and Doctoral projects.
- Grow external funding basis.
- Grow number of rated researchers.
- Grow Multi-, Inter- and Trans disciplinary research.

The aim of the plan is to contribute to:



Engagement



Innovation



Socio-economic development



Entrepreneurship



Sustainability

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 • Post-doctoral training • Programme on postgraduate supervision • Programme on scientific writing • Programme on technology transfer and innovation • Annual faculty research seminars • Colloquiums and discussion groups
Research partnership development	Capacity growth of research projects	<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 Strategy

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 Programme • Master's Education Programme • Doctoral Education Programme • Next Generation Researcher Programme • Postdoc Fellowship Programme 	<ul style="list-style-type: none"> • Emerging Researchers Programme • Mid-career Researcher Programme • Established Researcher Programme • Black Female Researchers Career Programme • Rated Researchers Programme
	Strategy 2: Increasing the enrolment of postgraduate students		
	Strategy 3: Growing the seniority of the academic staff profile		
	Strategy 4: Introducing <i>research leave</i> to optimise opportunity for research participation		
Structural development strategies	Strategy 1: Reactivation of 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 <i>input</i> and <i>process</i> indicators in support of the <i>output</i> , <i>outcome</i> and <i>impact</i> indicators.		
	Strategy 1: Rolling-out of scientific writing skills programme		
	Strategy 2: Implementing revised <i>INTERIM</i> 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.		

The Programme

The university's R&D Plan 2014 – 2020 emphasises the following ten strategic research programmes:

Ten research and development programmes	Outcomes
Undergraduate to Graduate Student Programme	Successful completion of studies; increase postgraduate enrolment; and funding applications for postgraduate studies.
Master's Education Programme	Successful completion of studies within the residential period; and application for funding.
Doctoral Education Programme	Successful completion of studies within the residential period; and application for funding.
Next Generation Researcher's Programme for staff studying towards a doctorate	Completion of doctoral degree; and application for funding.
Emerging Researcher's Programme	Following completion of a doctoral degree; preparing for a research career. Development of research competencies: supervision, publication, presentations, and application for funding. This programme is typically intended for newly appointed staff who graduated within the past two years.
Postdoctoral Fellowships	Publication writing; funding application for current research project; conference attendance; supervision; contribution to research development and planning; and in general, attending research forums, workshops and presentations at CUT.
Mid-Career Researcher's Programme	Delivering outputs that would typically lead at a national level; and developing an own research programme, with participating members and students, research competencies and infrastructure in support of research.
Established Researcher's Programme	Becoming an international leader in a research programme, with a critical mass, and recognition as a leader in the field of study; and national and international funding, collaboration and joint programmes,
Women in Research Programme	Completed doctorate, scholarships, publications, presentations, supervision, support, and applications for funding, depending on the level of experience and the qualification.
Rated Researcher's Programme	Maintain rating; and national and international recognition.

The following additional programmes and projects have been introduced in support of the R&D Plan:

- CUT and UFS Joint Research Programme (optimising capacity and sharing of resources)
- Research Entities (Centres, Units and Groups Project)
- These programmes and projects are being funded through university funding (R&D Budget, 2016), DHET R&D Grant and External Funding Agencies (primarily NRF).

The next section of the report will provide feedback on the progress of implementation of the programmes and on the budget available in support of research.

Review of 2016 - Research Development Achievements

Institutional Repositioning Research Development and Postgraduate Studies Leadership

Since 2014 R & D management moved from a centralised approach to a decentralised approach. This resulted in the appointment of Faculty Research Managers as from 2014 who supported Faculty Deans with the management and development of research in the Faculties. In 2016 the university in ensuring unreserved focus on research and innovation resulting in a strategic decision to establish a separate research and innovation portfolio. This resulted in the appointment of Faculty Assistant Deans: Research, Innovation and Engagement who supported Faculty Deans with the management and development of research in the Faculties.

Due to the split of the Academic and Research portfolio in 2016 into Teaching and Learning and Research, Innovation and Engagement, a new section was introduced to support and facilitate research development and postgraduate studies at the university. The first activity was to appoint a Director for Research Development and Postgraduate Studies. Professor Laetus Lategan was appointed as the Director of the RD & PGS Studies.

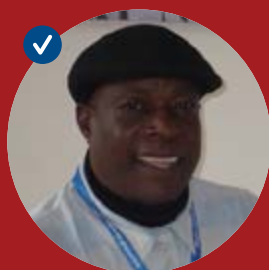
Professor Laetus. Lategan
Director: Research Development
& Postgraduate Studies
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In 2016 the Assistant Deans: RIE for the Faculties were:



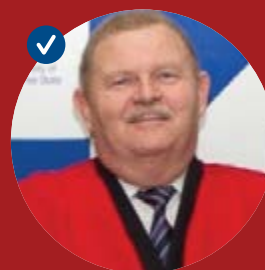
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Annual Research Breakaway

The annual University Research and Development Breakaway was held on 30 August 2016 under the theme of "Looking Back to Planning Forward".

From the presentations it was clear that the Research and Development Plan 2014-2020 is delivering on the strategies to grow research outputs by means of more publications and completed postgraduate studies, increasing the external funding basis and the number of competitive research programmes and structures and programmes in support of growing the research basis of the university.

The following key observations were made:

- General agreement that the university cannot provide all the resources and the need to be mindful on how the available resources are used.
- Repositioning of the university in an environment with factors such as #fees must fall, massification, focus on science and impact factor for sustainability.
- There is a need to break the silos and focusing on MIT research.
- Should there be additional requirements for professors and post-docs with regard to research outputs.
- There is a need to implement an intensive research marketing drive.
- Based on the discussions of the breakaway the key activities will be initiated in 2017 in order to enhance the research culture. The following important pointers were identified that will be further developed during 2017:
 - Access to and expenditure of external funding.
 - Relevance of research projects to be more competitive with increased visibility (engagement) and impact.
 - Promoting research dialogue as part of growing a research culture.
 - Growing the postgraduate student experience beyond the thesis. The requirement that doctoral students should publish at least one article in an accredited journal to be enforced from 2017 academic year.
 - Growing the cohort of female researchers.



Research Funding and Support

The following progress can be reported:

Research funding available for 2016

The following research funds were available during the first semester 2016:

Agency	Funding objective	Amount
CUT	Operational Research Funds	R 14 000 000
DHET R & D Grant	Support research capacity building	R 10 025 520
NRF	Support research projects and student training	R 18 722 452
PA & A Malan Trust	Studies in art and project on research education	R 130 000
Total		R 42 878 172

The R & D Section has a budget of R 42 878 172 available for research activities.

DHET Research and Development Grants

Since 2013, the DHET approved and provided an R & D Grants for the financial years - 2013/2014, 2014/2015, 2015/2016 and 2016/2017

Comprehensive progress reports for financial years 2013/2014, 2014/2015 and 2015/2016 were submitted to DHET on 31 May 2016. These reports included a request and plans to roll-over funding which could not be utilized due to delays in allocation of funding by DHET.

The following highlights can be recorded:

2013-2014

Projects 1, 2 and 7 were completed in 2013-2014. The outcomes of the Projects 3, 4, 5, and 6 are: Researchers were able to establish international networks, to influence the under- and postgraduate curriculum through an entrepreneurial focus and postgraduate assessment, to procure new equipment, to graduate Masters and Doctoral students, to publish research results via accredited papers, books and conference proceedings and to present papers at national and international level. This contributed towards an enabling research environment. All these outputs are directly related to the objectives outlined in the university's R & D Plan, 2014-2020.

2014-2015

Project 1: Mentorship/Supervisor Training Programmes

The focus of this programme is to train the next generation of researchers and students in doing research. All workshops were completed as per plan.

Project 2: Research Capacity Development Programme

The focus of this programme is to build research capacity in the Faculties. This was achieved through the development of research entities consisting of two (2) Centres, twelve (12) Units and seven (7) groups that will deliver on critical mass, postgraduate student training and publications. Researchers will also be supported to improve their research environment through growing research capacities and to identify strategic research projects and opportunities in line with the university's vision statement. The grant was also used to build capacity of research managers in Grant Proposal Writing and Grants Management.

Project 3: Postgraduate Study Support Programmes

This programme is in line with the main objective of the DHET Grant allocation, namely for staff to improve their qualifications. The university has currently close to 32% staff with doctorates. The funding was used to support a total of 78 staff members consisting of 33 Master's and 45 staff members for Doctoral studies in improving their qualifications.

Project 4: Postdoctoral Research Fellowship Programmes

The programme supported five (5) Postdoctoral fellows with their research projects in natural and agricultural sciences and interdisciplinary research in engineering and management science. Outputs such as publications and completed studies by students can be reported as outputs.

Project 5: Academic Exchange Programmes

The university took on the initiative to promote active participation with Cluster A and B universities that will deliver on joint postgraduate supervision and joint publications. Four (4) joint research collaboration projects in the fields of Chemistry / Health Sciences, Environmental Sciences and Civil Engineering were funded. Some research outputs on research papers, publication and Master's students finalising their dissertations can be reported. Faculties also established networks and collaborations with local and international partners.

Project 6: Topping up of NRF Funds

NRF projects were supplemented. No rolls over funds were requested for this project.

Project 7: Management/Administration of the Research Development Grant

A Project Assistant was appointed to assist with the administration of the grants.

2015-2016

Project 1: Mentorship/Supervisor Training Programmes

The focus of this programme is to train the next generation of researchers and students in doing research. A first workshop on the Research Process was offered on the Bloemfontein and Welkom campuses respectively. Two more institutional workshops were presented on postgraduate studies and research ethics and integrity as well as discipline specific workshops per Faculty.

Project 2: Research Capacity Development Programme

The focus of this programme is to build research capacity in the Faculties. This was achieved through the support to develop the Research Centres, Units and Groups that will deliver on critical mass, postgraduate students and publications. Researchers were supported to improve their research environment through growing research capacities and to identify strategic research projects and opportunities in line with the university's vision statement.

Project 3: Postgraduate Study Support Programmes

This programme is in line with the main objective of the DHET Grant allocation, namely for staff to improve their qualifications. The university has currently close to 32% staff with doctorates. The funding was used to support staff with their Master's and Doctoral qualifications.

Project 4: Postdoctoral Research Fellowship Programmes

The programme is intended to support Postdoctoral fellows with their research projects. Outputs such as publications and completed studies can be reported.

Project 5: Academic Exchange Programmes

The university took on the initiative to promote active participation with Cluster A and B universities that will deliver on joint postgraduate supervision and joint publications. The programme enhanced existing expertise and supported identified networks and collaboration with other universities.

Project 6: Topping up of NRF Funds

NRF projects will be supplemented. Rated Researchers (L and Y category) and Thuthuka Grantholders were supported.

Project 7: Management/Administration of the Research Development Grant:

A Project Assistant was appointed to assist with the administration, monitoring and evaluation of the grants.





Support to Postgraduate Students

For 2016 the following grants were awarded to M and D Degree students and postdoctoral fellows. This can be compared to the period 2014 – 2015 during which R6 565 744 was awarded to M and D degree students and postdoctoral fellows:

Scholarships, 2016:

Year	M students	D students	Postdocs
2016	R 5 229 930*	R 3 205 660*	R 600 000
Total			R 9 035 590

* Note: These awards include R 2 709 310 for tuition fees.

Scholarships, 2014-2015:

Year	M Students	D Students	Postdocs
2014	R957 880	R628 494	R880 000
2015	R1 972 340	R1 147 030	R1 000 000
Total	R2 930 220	R1 775 524	R1 880 000
Grant total			R 6 585 744

From the 2016 awards, we can note the following:

- R 1, 821 m was awarded to 61 M and D students for continuation funding (second year and more award)
- R 6 704 590 was awarded to 131 M and D students as first time applicants.
- R 2 938 290 was awarded to Full-time Master's students.
- R 2 291 640 was awarded to Part-time Master's students.
- R 2 227 120 was awarded to Full-time Doctoral students.
- R 978 540 was awarded to Part-time Doctoral students.
- 3 x R 200 000 as stipend awarded to postdoctoral students
- 47 x Full-time Master's students were grantholders in 2016.
- 88 x Part-time Master's students were grantholders in 2016.
- 31 x Full-time Doctoral students were grantholders in 2016.
- 26 Part-time Master's students were grantholders in 2016.

NRF funding 2016

For the period January – December 2016 the following funding was received from the NRF:

Programme	Number of Awards	Award Amount
Staff Awards: 47 (32 Male and 15 Female) (45% of total NRF funding)		
DST Conference Funds (1M)	1	R 200 000,00
Incentive funding for Rated Researchers (8M1F)	9	R 340 000,00
Indigenous Knowledge systems (1F)	1	R 560 000,00
International Science and Technology Agreements (1F)	1	R 14 535,60
Knowledge Interchange and Collaboration (17M 4F)	21	R 560 262,00
National Equipment Fund (1M)	1	R 3 390 000,00
CSIR Laser Pool Equipment (1M)	1	R 168 000,00
SA Research Chairs (1M)	1	R 1 504 000,00
Sabbatical Grant (1F)	1	R 39 179,00
Research Advancement Career Award (1F)	1	R 527 319,82
Thuthuka (3M 4F)	7	R 1 136 034,00
nGap (1M 1F)	2	R 60 000,00
Subtotal		R 8 499 330,00
Student Awards - 202 (55% of total funding)		
SANHARP	1	R 55 000,00
SKA	4	R 292 000,00
Freestanding Doctoral	4	R 541 122,00
Doctoral Block Grants	12	R 1 320 000,00
Freestanding Master's	13	R 1 115 000,00
Master's Block Grants	26	R 1 940 000,00
DAAD Freestanding Master's	1	R 70 000,00
DAAD Block Grant	2	R 140 000,00
BTech Block grants	139	R 4 750 000,00
Subtotal	249	R 10 223 122,00
Grand Total		R 18 722 452,42

Note: Although the National Equipment Award was awarded for the period December 2015 – December 2016 the funds will only be available in 2016.

Progress – Research Outputs

DHET Publication submission 2014 (n-1) in 2015 (n)

In terms of the *Policy and Procedures for the Measurement of Research Output of Public Higher Education Institutions (2003)*, all public Higher Education Institutions (HEIs) must submit annually their subsidy funding claims for research outputs, in the form of publications, to the Department of Higher Education and Training (DHET). The DHET allocates research subsidy based on unit calculations for approved publications.

In May 2016 Central University of Technology (CUT) submitted a claim of the 2015 research publications amounting to **109.85** units for books, conference proceedings and journals. Following the evaluation of the 2015 research outputs by the DHET, CUT was allocated a total of **106.48** units. This is an increase of **19.31** units from **87.17** units awarded for 2014 publications. This represents **22%** growth from **2014 to 2015**. The institutional publication trend for all publications (books, journals and conference proceedings) over the past five years (2011-2015) is shown in Figure 1.

From Figure 1 the following is evident:

- Since **2011- 2015** there was **86% growth** in journal publications. From 2014-2015 the growth was less than 5%.
- Conference proceedings can now be regarded as a sustained research output for the university with a **126% growth** from 2014-2015. The biggest growth from 2014-2015 is in the Faculty of Engineering and Information Technologies which grew by **87%**. It is evident that the Faculty of Engineering and Information Technologies benefited from this research outlet.

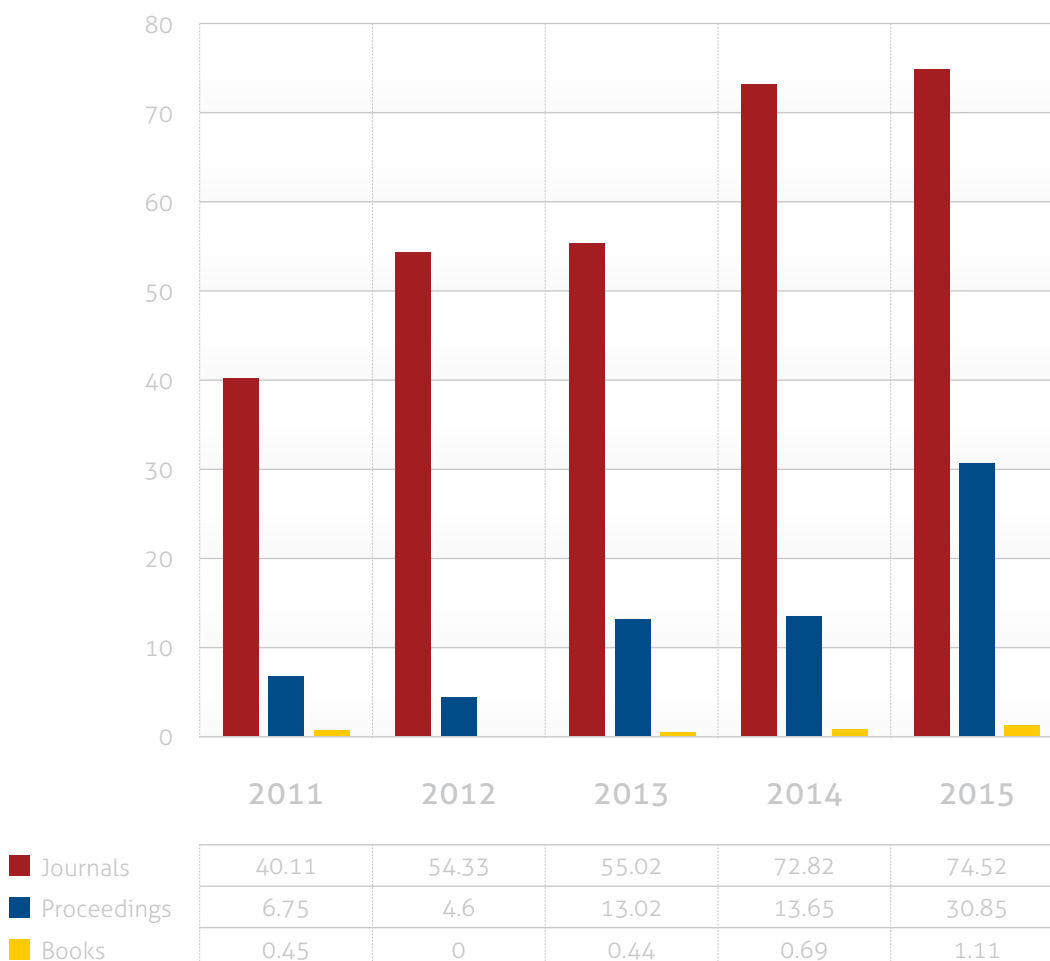


Table below provides the number of unit publications by the different CESM categories and by type of publication.

Table: Overall research output units by CESM category, 2015 relative to 2014 and 2013

Academic Year 2015					
CESM category	Journal units	Conference units	Books units	Total	% Total
CESM 1(Agriculture, agricultural operations and related sciences)	4.00	0.00	0.54	4.54	4.3%
CESM 2(Architecture and building environment)	3.82	7.40	0.25	11.47	10.8%
CESM 3(Visual and performing arts)	1.00	0.00	0.00	1.00	0.9%
CESM 4(Business, economics and management studies)	16.16	2.17	0.00	18.33	17.2%
CESM 5 (Communication, journalism and related studies)	0	0	0	0	0.00%
CESM 6(Computer and information sciences)	1.33	3.00	0.00	4.33	4.1%
CESM 7(Education)	22.83	9.50	0.00	32.33	30.4%
CESM 8(Engineering)	14.78	8.58	0.07	23.43	22.0%
CESM 9(Health profession and related clinical sciences)	3.85	0.00	0.25	4.10	3.9%
CESM 10(Family ecology and consumer sciences)	1.00	0.00	0.00	1.00	0.9%
CESM 13(Life sciences)	2.42	0.20	0.00	2.62	2.5%
CESM 14(Physical sciences)	1.00	0.00	0.00	1.00	0.9%
CESM 17(Philosophy, religion and theology)	1.33	0.00	0.00	1.33	1.2%
CESM 18 (Psychology)	1.00	0.00	0.00	1.00	0.9%
Total	74.52	30.85	1.11	106.48	100%

Note: CESM with no outputs and not included in the table are: CESM 11(Languages, linguistics and literature), CESM 12(Law), CESM 15(Mathematics and statistics), CESM 16(Military sciences), CESM 19(Public management and services), CESM 20(Social sciences)

2015

30.4%

CESM 7 (Education)

22.0%

CESM 8 (Engineering)

17.2%

CESM 4 (Business, economics and management studies)



2014

Total units

72.83

Journals

13.65

Conference

0.69

Books

Academic Year 2014

CESM category	Journal units	Conference units	Books units	Total	% Total
CESM 1(Agriculture, agricultural operations and related sciences)	1.66	0.00	0.00	1.66	1.9%
CESM 2(Architecture and building environment)	3.25	3.95	0.00	7.20	8.3%
CESM 3(Visual and performing arts)	0	0	0	0	0.00%
CESM 4(Business, economics and management studies)	12.48	2.00	0.36	14.84	17.0%
CESM 5 (Communication, journalism and related studies)	0.50	0.00	0.00	0.50	0.6%
CESM 6(Computer and information sciences)	1.00	2.50	0.00	3.50	4.0%
CESM 7(Education)	26.83	1.00	0.33	28.16	32.3%
CESM 8(Engineering)	11.41	3.70	0.00	15.11	17.3%
CESM 9(Health profession and related clinical sciences)	12.20	0.00	0.00	12.20	14.0%
CESM 10(Family ecology and consumer sciences)	0.00	0.00	0.00	0.00	0.00%
CESM 13(Life sciences)	0.00	0.00	0.00	0.00	0.00%
CESM 14(Physical sciences)	0.50	0.00	0.00	0.50	0.6%
CESM 17(Philosophy, religion and theology)	2.00	0.00	0.00	2.00	2.3%
CESM 18 (Psychology)	1.00	0.50	0.00	1.50	1.7%
Total	72.83	13.65	0.69	87.17	100%

Note: CESM with no outputs and not included in the table are: CESM 11(Languages, linguistics and literature), CESM 12(Law), CESM 15(Mathematics and statistics), CESM 16(Military sciences), CESM 19(Public management and services), CESM 20(Social sciences)

2013

Highest number of units

18.34%

CESM 8 (Engineering)



Academic Year 2013					
CESM category	Journal units	Conference units	Books units	Total	% Total
CESM 1(Agriculture, agricultural operations and related sciences)	3.48	0.25	0	3.73	5.40%
CESM 2(Architecture and building environment)	0.00	0.00	0.00	0.00	0.00
CESM 3(Visual and performing arts)	0	0	0	0	0.00%
CESM 4(Business, economics and management studies)	11.33	0.50	0.22	12.05	17.60%
CESM 5 (Communication, journalism and related studies)	2.00	0.00	0.00	2.00	2.90%
CESM 6(Computer and information sciences)	2.00	2.25	0.00	4.25	6.20%
CESM 7(Education)	15.49	1.74	0.22	17.45	25.50%
CESM 8(Engineering)	10.15	8.28	0.00	18.43	26.90%
CESM 9(Health profession and related clinical sciences)	6.66	0.00	0.00	6.66	9.70%
CESM 10(Family ecology and consumer sciences)	2.25	0.00	0.00	2.25	3.30%
CESM 13(Life sciences)	0.33	0.00	0.00	0.33	0.50%
CESM 14(Physical sciences)	0.00	0.00	0.00	0.00	0.00%
CESM 17(Philosophy, religion and theology)	1.33	0.00	0.00	1.33	1.90%
CESM 18 (Psychology)	0.00	0.00	0.00	0.00	0.00%
Total	55.02	13.02	0.44	68.48	100%

Note: CESM with no outputs and not included in the table are: CESM 11(Languages, linguistics and literature), CESM 12(Law), CESM 15(Mathematics and statistics), CESM 16(Military sciences), CESM 19(Public management and services), CESM 20(Social sciences)

The following observations are made:

- In 2015 the highest number of units of **32.33** across all publication types was awarded to CESM category 7 (Education), followed by CESM category 8 (Engineering) at **23.43** and CESM category 4 (Business, economics and management studies) at **18.33**. The scholarship of teaching and learning contributed to the outputs in CESM 7.
- In contrast in 2014, total number of units **87.17**, the highest number of units (**28.16**) across all publication types was awarded to category 7 (Education), followed by CESM category 8 (Engineering) at 15.11 and CESM category 4 (Business, economics and management studies) at 14.84. In 2013, total number of units **68.48**, the highest number of units (**18.43**) across all publication types was awarded to CESM category 8 (Engineering), followed closely by CESM 7 (Education) at **17.45**.



Table below provides the contribution per Faculty on the total research outputs.

Table: The total research outputs per Faculty

Academic Year 2015					
CESM category	Journal units	Conference units	Books units	Total	% Total
Faculty of Health Sciences (CESM 1, 9, 10, 13 & 14)	12.27	0.20	0.79	13.26	12.5%
Faculty of Engineering & Information Tech (CESM 2, 6 & 8)	19.93	18.98	0.32	39.23	36.90%
Faculty of Humanities (CESM 3, 5 & 7)	23.83	9.50	0.00	33.33	31.30%
Faculty of Management Sciences (CESM 4)	16.16	2.17	0.00	18.33	17.2%
Publications not Aligned to Faculty (CESM 5,17,18)	2.33	0.00	0.00	2.33	2.10%
Total	74.52	30.85	1.11	106.48	100%

Academic Year 2014					
CESM category	Journal units	Conference units	Books units	Total	% Total
Faculty of Health Sciences (CESM 1, 9, 10, 13 & 14)	14.36	0.00	0.00	14.36	16.50%
Faculty of Engineering & Information Tech (CESM 2, 6 & 8)	15.66	10.15	0.00	25.81	29.60%
Faculty of Humanities (CESM 3, 5 & 7)	27.33	1.00	0.33	28.16	32.9%
Faculty of Management Sciences (CESM 4)	12.48	2.00	0.36	14.84	17.0%
Publications not Aligned to Faculty (CESM 5,17,18)	3.00	0.50	0.00	3.50	7.50%
Total	72.83	13.65	0.69	87.17	100%

Academic Year 2013					
CESM category	Journal units	Conference units	Books units	Total	% Total
Faculty of Health Sciences (CESM 1, 9, 10, 13 & 14)	12.72	0.25	0.00	12.97	18.90%
Faculty of Engineering & Information Tech (CESM 2, 6 & 8)	12.15	10.53	0.00	22.68	33.10%
Faculty of Humanities (CESM 3, 5 & 7)	17.49	1.74	0.22	19.45	33.26%
Faculty of Management Sciences (CESM 4)	11.33	0.50	0.22	12.05	17.60%
Publications not Aligned to Faculty (CESM 5,17,18)	1.33	0.00	0.00	1.33	2.30%
Total	55.02	13.02	0.44	58.48	100%

In 2015, CESM categories grouped by Faculty, the most contribution on research outputs is from Faculty of Engineering & Information Tech at 39.23 units (36.9%), followed by Faculty of Humanities at 33.33 units (31.30%).

- Institutionally, of concern is the proportion and decline in research outputs from STEM related research. In 2015 STEM contributed 49.4% relative to 2014 and 2013, STEM contributed 47% and 52%, respectively.

Table below reflects the publication outputs since 2004:

Publication outputs 2004-2015											
Year	2004	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015
Articles	26.99	25.23	28.3	22.38	33.04	31.71	40.11	54.33	55.02	72.83	74.52
Proceedings	2	1.6	0	0.5	1.67	7.85	6.75	4.6	13.02	13.65	30.85
Books	0	0	0	0	0.55	0	0.45	0	0.44	0.69	1.11

From these outputs the following observations can be made:

- A continuous growth in article publication outputs since 2004.
- A major growth in published conference proceedings since 2013.
- The research outputs are not focusing on scholarly books for peers but presumably more for the textbook market.

Postgraduate Studies

The following M and D graduations can be reported for the period 2001 - 2016:

Completed Postgraduate Studies			
Year reported	M Degrees	D Degrees	M Course Work
2001	11	1	
2002	16	2	
2003	19	6	
2004	19	5	
2005	13	5	3*
2006	17	8	2*
2007	31	4	
2008	22	11	
2009	25	5	
2010	27	6	
2011	17	3	
2012	35	6	
2013	29	3	
2014	37	13	
2015	29	13	
2016	53	19	
TOTAL	400	110	5

Note: Course work programme discontinued.

Staff and Student Training

- Workshops on the Research Process

The following staff and student training workshops were conducted in 2016:

Table: Staff and student training

Date	Venue	Focus	Number of Attendees
24 February	Bloemfontein	Lecture on Doctoral Studies in South Africa	35
4 March	Bloemfontein	The research process	66 (12 staff + 54 students)
10 May	Welkom	The research process	51 (13 staff + students)
26 Augustus	Bloemfontein	Research Ethics and Integrity	20

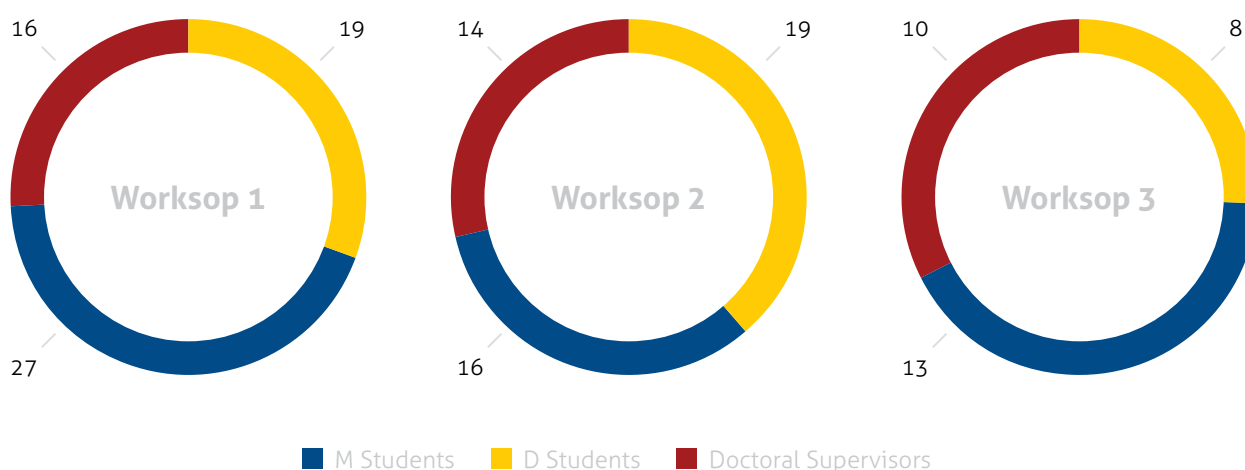
The RD & PGS Section also hosted a series of research workshops on postgraduate supervision. Table below provides feedback on the number of attendees per workshop:

Table: Research Training on Postgraduate supervision

Workshop	M Students	D Students	Doctoral Supervisors
Workshop 1	19	27	16
Workshop 2	19	16	14
Workshop 3	8	13	10

A cumulative total of 314 staff and students attended.

Visual representation of Research Training on Postgraduate supervision:





Research Centres, Units and Groups

The Senate approved a University Policy on Centres, Units and Groups on the 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 updated policy was approved end 2015. The objectives of this 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.

A total of 2 Centres, 12 Units and 7 Groups were approved in 2016.

The Research Development and Postgraduate Studies Section was leading a process to review these entities, to group relevant entities together and to realign the entities' focus with regional, national and international demands. The repositioning of Centres, Units and Groups was planned to be rolled-out in three phases:

- In Phase 1 (May-September) the leaders of the respective Centres, Units and Groups will attend to the alignment of Centres, Units and Groups to the policy regulating this matter. The emphasis will also be on grouping relevant entities together.
- In Phase 2 (October) the Research Development and Postgraduate Studies Section will engage with the leaders of the Centres, Units and Groups. Where needed, relevant experts will be invited to assist the research entities with their repositioning. (Research entities will identify their own experts if required.)
- In Phase 3 (November) the information will be consolidated and submitted to URIC for approval.
- The new entities should be operational from 2017.

Due to limited response back from the Faculties, the RD & PGS Section will visit each Centre, Unit and Group in 2017 to conclude the process.

Joint Research Call CUT and UFS Research Programme

The Central University of Technology Free State (CUT) and the University of the Free State (UFS) undertook a joint research call with equal funding by both institutions. The collaboration was a first between the two universities and aimed at strengthening research within the institutions in the Free State Province. The research collaboration focused on the following objectives:

1) Building research critical mass, 2) Improvement of research outputs – publications and postgraduate supervision, and 3) Joint funding proposals.

Five research projects were funded for the period July 2015 – June 2016 as reflected below:

- Bioprospecting for plant products for application in animal, human and plant health: Chemistry / Health Sciences.
- Detection and characterization of emerging microbial pathogens and contaminants from drinking and recreational surface water in the Mangaung area: Environmental Microbiology / Water Quality within Natural Sciences.
- Re-engineering of civic infrastructure towards sustainable human settlements in the Free State, South Africa: A case study of Kopanong Municipal area: Civil Engineering / Urban Planning
- Using soil maps to infer engineering properties for optimizing urban planning: Civil Engineering / Urban Planning.
- Healthcare Ethics.

A new call was posted for the period July 2016 – June 2017.

The following progress can be reported:

- The four project owners of awards in 2015 were invited to submit progress report for continuation funding.
- Three continuation reports were received.
- Three new applications received.

The following awards were made:

- Project on *Bio prospecting for plant products for application in animal, human and plant health.*
- Project on *Housing markets and socio-economic development in Mangaung.*
- Medical Education *Research Training and Capacity Building.*

A third round of calls will be posted in 2017.





Research Ethics and Integrity Committee

A Research Ethics and Integrity Policy Framework together with a Constitution for the Research Ethics and Integrity Committee, as a sub-committee of the URIC, were approved by Senate in November 2016.

The main purpose of the framework as part of the core values of the university is to promote responsible conduct of research in line with internationally acceptable norms and standards. It is important that during implementation, the framework must be interpreted in the context of and in line with other relevant policies and guidelines relating to research and academic ethics and integrity matters.

The policy framework contains the following key elements:

- Research Ethics and Integrity Code of Conduct for Researchers
- Ethics Committees: Structures and Roles - Research Involving Humans, Animals and the Environment.

Ethical approval process:

- An application must be submitted to the (Faculty Research and Innovation Committee) FRIC using the Application Form LS262a. The ethical clearance number will be allocated by the FRIC in the LS262a.
- Application for research with humans and animals on ethical clearance must be provided by a legally approved Clinical Ethical Committee and Animal Ethical Committee. Currently there is an agreement with the University of the Free State.
- Access to either people or data approval should be sought at the Office of the Director: Institutional Planning and Quality Enhancement.
- All research protocols approved in 2017 should be provided with a copy of Ethics Clearance Letter signed by the Chairperson of the FRIC.
- The Policy Framework will be implemented in 2017.



University Journals

The university publishes in two journals, the Journal for New Generation Sciences, a DHET accredited journal, and the Interim, an in-house journal to promote writing skills.

The performance of these journals is based on official statistics from Sabinet Online for the time period 2012 until end 2016.

This part of the report indicates the number of times the Interim and Journal for New Generation Sciences were **downloaded** and **viewed** for the time period 2012 - 2016 from the Sabinet Online platform SA ePublications:



Product download report for the Interim: Interdisciplinary Journal

Year reported	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012	0	0	0	2	6	9	18	32	25	31	24	38	185
2013	25	78	156	64	128	124	183	331	304	397	429	407	2626
2014	589	755	1366	1736	1413	1123	1230	1414	1769	2762	2065	1562	17784
2015	1446	1144	1931	1868	1382	1980	1967	2337	2034	1401	1320	1452	20262
2016	1794	2350	1607	1278	1277	1101	991	1205	1174	1156	1240	752	15925

Product views report for the Interim: Interdisciplinary Journal

Year reported	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012	0	0	0	0	6	9	15	70	170	98	531	359	1258
2013	134	77	136	80	107	95	108	151	117	180	95	95	1375
2014	251	285	737	1369	1331	1094	1263	1453	1456	1348	1086	884	12557
2015	1210	897	1159	1190	1092	1384	1309	1549	1450	1655	1176	1461	15532
2016	1292	1645	1372	1406	1481	1652	1076	988	548	952	936	648	13996



Product download report for the Journal for New Generation Sciences													
Year reported	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012	0	0	0	0	0	0	0	0	58	67	73	46	244
2013	45	82	275	150	226	289	371	341	421	645	670	575	4090
2014	522	911	1609	1827	1897	1739	1440	1448	1788	3656	2006	1772	20615
2015	1394	1274	1886	1785	1417	1785	1786	1928	1848	1506	1317	1505	19431
2016	1752	2863	1823	1819	1649	1285	1306	1445	1444	1098	1154	847	18485

Product view report for the Journal for New Generation Sciences													
Year reported	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2012	0	0	0	0	0	0	0	0	275	88	791	384	1538
2013	381	141	228	188	247	247	218	254	232	225	146	210	2717
2014	322	668	1363	1409	1377	1199	1202	1199	1423	1817	1343	1168	14490
2015	977	956	1213	1233	1263	1516	1580	1389	1453	2375	1369	1782	17106
2016	1634	1561	1730	1436	1822	976	1097	1387	889	856	1022	768	15178



Interpretation:

- The high visibility of the journals are due to its online status (open access journals). With the application for the JNGS to be accommodated on Scopus the visibility will increase even more.
- For the period 2016 the Interim has collectively 15 925 views and 13 996 downloads and the JNGS 18 485 views and 15 178 downloads.
- The latest discussions in scientometrics suggests that ever two downloads represent one citation. Should this argument become a reality that it will contribute towards the impact factor of the journals. A random selection of authors in 2014 suggests an h-index of 4.

Summative Progress

The following summative progress can be reported.

Table: Progress with CUT R & D Programmes and Projects

Progress with CUT R & D Programmes and Projects			
Programme/ Project	Target	R & D Support	Output
Undergraduate to graduate Programme	Grow total postgraduate student enrolment with 5% of overall student enrolment (5% x 16 000 = 800)	Funding support Training support Publication support	R 4 750 000 awarded. 3 x Workshops 590 student enrolments. 3.75 % of total enrolment.
Master's Programme	1.8% of total student enrolment	Funding support Training support Publication support	R 8494 930 awarded. 3 x Workshops 130 student enrolments. 1.84 % of total enrolment. 53 Master's students graduated
Doctoral Programme	0.7% of total student enrolment	Funding support Training support Publication support	R 5166 782 awarded. 3 x Workshops. 49 student enrolments. 1.04% of total enrolment. 19 Doctoral students graduated
Next Generation Researchers Programme	50% of staff with doctorates by 2020	Funding support Training support Publication support	R 3519 000 funding support available 79 Staff benefitted from DHET R&D Grant to promote qualifications. 105 Staff with Doctorates. 100 Staff active in postgraduate supervision.
Postdoctoral Fellowship Programme	5	Funding support Training support Publication support	Living stipends awarded = R600 000 and Project expenses of R370 000
Women in Research Programme	Grow number of female researchers.	Funding support Training support Publication support	1 x Application to NRF sabbatical programme for 2017. 1 x Career Development Award for 2016
Rated Researchers Programme	10	9 Rated Researchers	R 400 000 allocated to sustainability of rated researchers. 1 x Renewal applications submitted. Outcome still pending. 2 x New application submitted. One approved.
CUT and UFS Joint Research Programme	5	Funding support	8 Applications funded = R 495 000.
Centres, Units and Groups Project	2 Centres 7 Units	Funding support Training support Publication support	R 495 000 allocated for research entity development. Repositioning of entities. 2 Centres. 12 Units. 7 Groups.
Sabbatical Programme	Grow annual staff qualifications by 10%	Funding support Training support Publication support	3 x applications to NRF
SARCHI Chair	2 SARCHI Chair	Funding support	NRF approved SARCHI chair in medical product development

A photograph of a modern brick building with large windows and a sign that reads "LIBRARY AND INFORMATION SERVICES". The building is constructed of red brick and features several large, rectangular windows that are illuminated from within, casting a warm glow. The sign is mounted on a dark, curved section of the building's facade. The sky above is a clear, pale blue.

LIBRARY AND INFORMATION SERVICES

BUILDING THE RESEARCH STRUCTURE AND CAPACITY

PART 3

Research Entities: Centres, Units & Groups

Research within the university is organised based on the Policy on Centres, Units and Groups approved by Senate and Council in 2013 and reviewed in 2015. The policy is informed by the University Research and Development Plan, 2014 – 2020. During the year under review two (2) Research Centres, twelve (12) Research Units and three (3) Research Groups were approved.

CUT Research Clusters, Programmes and aligned Research Entities.		
Research Cluster 1	Research Programmes per Research Entity – Centre/Unit/Group	
Technologies and Innovations for Sustainable Development Objective: To investigate and apply technologies and/or innovation to foster and promote sustainable development	Research Programmes	Research Entity – Centre/Unit/Group
	Advanced Manufacturing	Centre for Rapid Prototyping and Manufacturing (CRPM)
	Energy and Sustainable Engineering	Unit for Evolvable and Manumation Systems (RGEMS)
	Sustainable Built Environment	Unit for Lean Construction and Sustainability
		Group for Sustainable Urban, Roads and Transport (SURT)
		Group of Soil Mechanics
	Water Resources Management	Unit for Sustainable Water and Environment
	Applied Information and Communication Technology Systems Engineering	Unit for Research on Informatics for Droughts in Africa (URIDA)
	Educational Technology	Research Group in Engineering Education (AGREE)
Research Cluster 2	Research Programmes per Research Entity – Centre/Unit/Group	
Quality of Health and Living Objective: To apply scientific research in different disciplines to improve on the quality of health and living standard of humans, animals and plants.	Research Programmes	Research Entity – Centre/Unit/Group
	Applied Food Safety and –Biotechnology	Centre for Applied Food and Biotechnology (CAFSB)
	Phyto-Pharmacology	Unit for Drug and Discovery Research
Research Cluster 3	Research Programmes per Research Entity – Centre/Unit/Group	
Socio-Economic and Entrepreneurship Development Objective: To do scientific research that empowers society for invaluable contribution to sustainable socio-economic development.	Research Programmes	Research Entity – Centre/Unit/Group
	Government Management	Unit for Public Management and Administration
	Entrepreneurship & project Management	Unit for Enterprise Studies
	Tourism and Leisure Management	Unit for Tourism Destination and Management
	Research Education	Unit for Research in Scholarship of Teaching and Learning (RSoTL)
		Unit for Scholarship in Research Education
		Unit for Foundations of Education
	Education - subthemes: science education and general education	Unit for Mathematics, Science and Technology Education Research



The following Research Centres and their key performance areas are highlighted:

Centre for Rapid Prototyping and Manufacturing (CRPM)

CRPM has, since its inception in 1997, been offering services to the Free State and national industry and has a client base of around 750. Annually, the centre completes on average 540 short term projects for industry, manufactures approximately 4000 parts and undertakes about 22 research projects. Since 2011 the CUT researchers and students have produced 29 peer reviewed journal articles and 51 peer reviewed conference papers. To further enhance the CRPM operations, the centre has established an international ISO 13485 quality management system and underwent an audit for certification by the international organisation TÜV in February 2016. The scope and focus of the CRPM Research Centre is positioned in the field of Additive Manufacturing (AM), more popularly known as 3D Printing. The Director: CRPM Research is Professor Willie du Preez, who is also the CUT coordinator of the national Collaborative Programme in Additive Manufacturing, funded by the DST since 2015.

The centre is supported by key researchers:

- Prof. Ihlar Yadroitsau, Research Professor, C1 rated researcher, Principal Investigator: NRF Research Chair in Medical Product Development through Additive Manufacturing
- Prof. Michele Truscott, Associate Professor: Mathematical and Physical Sciences
- Dr Kobus van der Walt, Senior Researcher: Mechanical and Mechatronics Engineering
- Mr Gerrie Booysen, Director: CRPM Services
- Dr Ina Yadroitsava, post-doctoral fellow
- Mr Jacques Combrink, Lecturer: Mechanical and Mechatronics Engineering
- Dr Maina Maringa, Senior Lecturer: Mechanical and Mechatronics Engineering

This team is further strengthened by external extraordinary professors.



Centre capabilities, qualification mix and capacity: On a strategic level the CRPM research focus areas are aligned with the recommendations of the SA AM Strategy as reflected in Figure below.

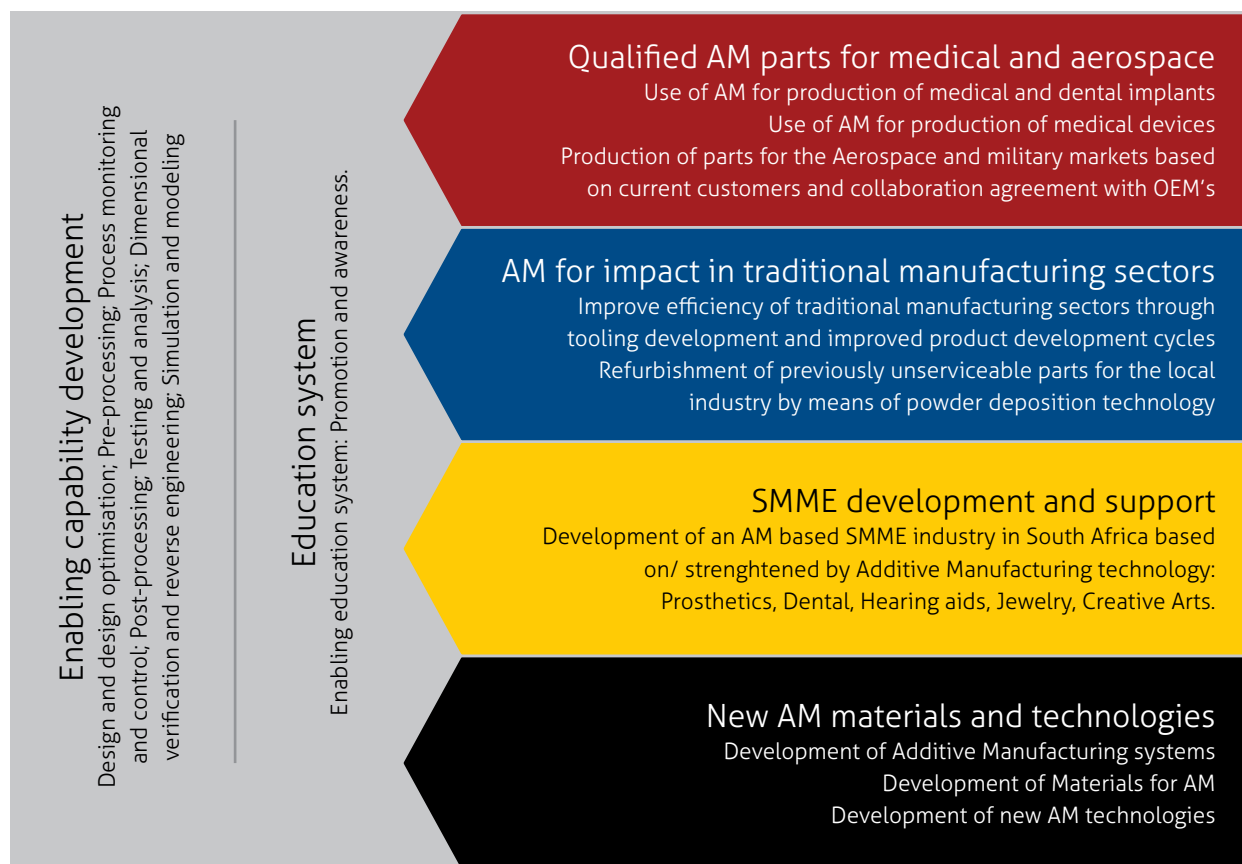


Figure: Focus areas recommended in the SA Additive Manufacturing Strategy

The CRPM postgraduate qualification mix includes the following:

- Materials science and metallurgical engineering.
- Mechanical engineering.
- Design, simulation and modelling, including industrial and graphic design.
- Laser physics.
- Product development.
- Medical expertise in reconstructive surgery.
- Prosthetics.

The combined expertise of the CRPM, the Product Development Technology Station (PDTs), Mechanical and Mechatronics Engineering and the Department of Design and Studio Art (DDSA) provides the opportunity to establish a research and development programme focused on niche areas that build on the strengths of CUT and result in offerings that contribute strongly towards improving the competitiveness of the Free State and South African industry.

Given these strengths of CUT, the following focus areas in the research and development (R&D) strategy of the CRPM have been defined:

- Development of qualified AM titanium alloy and polymer parts for medical implants and devices, as well as aerospace parts.
- Impact in traditional manufacturing sectors, particularly through advanced AM tooling.
- SMME development through AM for direct end-use in industry.

In support of the above, various projects on design for additive manufacturing are on-going and additive manufacturing machine/process development is also being pursued.

Based on the above, the research strategy of the CRPM Research Centre can be presented by the diagram in Figure below.

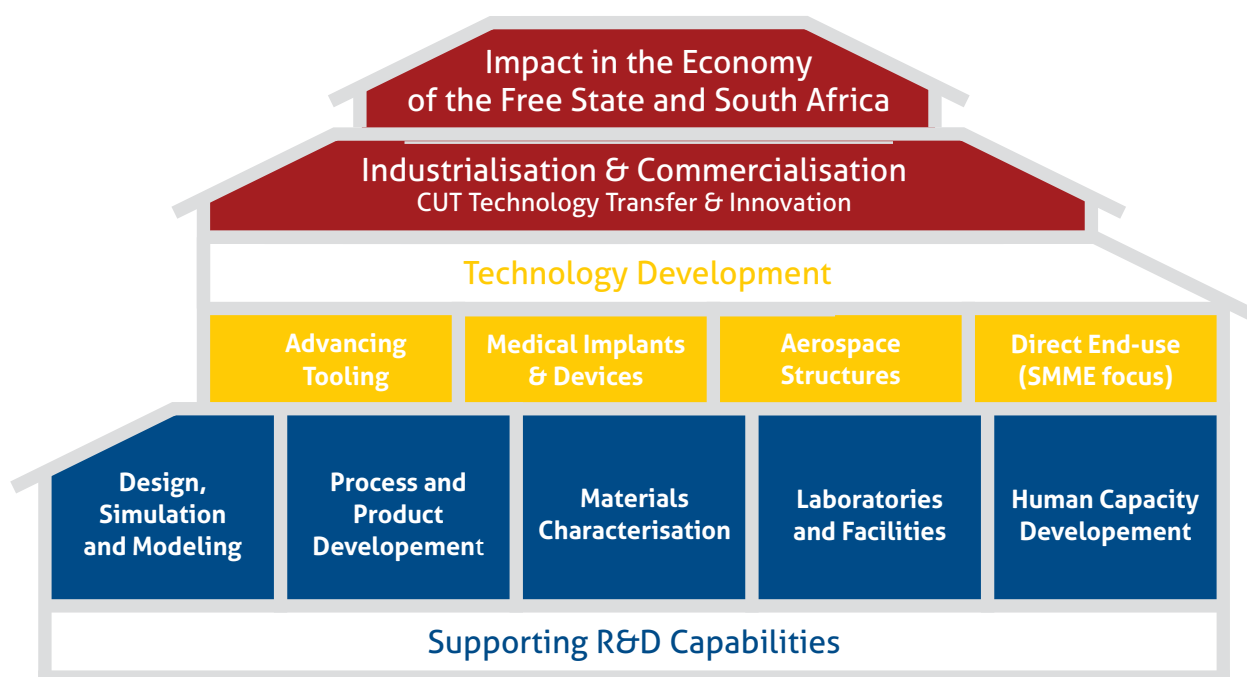


Figure: R&D Strategy of the CRPM Research Centre

The research outputs cover a wide range of applications of AM based on metal, polymer and sand powders and illustrates the impact the CUT R&D has had in the manufacturing industry and the medical field. The work by Prof. Ihar Yadroitsau and colleagues deals with physical aspects of laser-matter interaction; factors influencing selective laser sintering/melting processes; formation of inter-particle contacts and the rearrangement of particles during laser sintering of powder mixtures; balling processes; and the thermal properties of powders.

The research is supported by the following infrastructure:

- Substantial additive manufacturing infrastructure (estimated value: R35 million) is available in the CRPM. This includes 3 EOS metal AM machines, 6 polymer AM machines and 1 sand AM machine.
- The PDTS has a well-equipped mechanical workshop, as well as 3 scanners for reverse engineering. This technology station has a current capacity of 30 staff members and students.
- In addition to the above, a wide range of computer software packages (MIMICS™, MAGICST™, GeoMAGIC™, 3-MATIC™) for the conversion of CT and MR scan files into formats suitable for direct implementation into AM machines, is available. Design software (SolidWorks, SolidEdge) and finite element analysis packages (NASTRAN and PATRAN) are also available.
- In support of the required materials research, a materials laboratory with the basic equipment has been established.
- A teacher education laboratory with CRPM equipment on loan (Stratasys Dimension machine and handheld Z-Corp reverse engineering scanner) is operating for the exposure of future teachers to additive manufacturing/3D printing. This project was started in 2014 and now has five 3DSYSTEMS CUBE (desktop) machines. Around 90 future teachers have been exposed (over the last 3 years) to CAD and 3D printing, with each of them completing a design and 3D printed part.
- Equipment in the DDSA laboratory includes four ABS 3D printers, an Envision Tech Wax printer and a laser cutter.

Staff members of CRPM are part of the Rapid Product Development Association of South Africa (RAPDASA) which was founded in 2000. RAPDASA has played a national leading role in introducing Rapid Prototyping, currently known as Additive Manufacturing or 3D Printing, to the South African R&D community and industry. RAPDASA presents an annual international conference in which CUT staff and students have been, and are still, active participants with a number of papers presented each year.

The Centre for Applied Food Safety and Biotechnology

The Centre for Applied Food Safety and Biotechnology operates under the School of Agriculture and Environmental Sciences within the Faculty of Health and Environmental Sciences at the CUT, and 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 centre has over 100 publications and carries the status of Developed Niche Area at the NRF. It currently boasts a critical mass of about 32 members, including 11 master's and 8 doctorates, 1 post-doc, 3 full-time researchers; 3 external grant holders and 1 administrative assistant. The Centre Director is Prof. JFR Lues, an NRF rated researcher and in 2013 elected vice-president of the SA Association of Food Science and Technology.

The work of the centre falls mainly in the field of sciences – natural and science engineering technology.

- Level 1: Science, Engineering and Technology
- Level 2: Food Science
- Level 3: Food Safety

Postgraduate programme mix:

- Product shelf-life and packaging
- Spoilage and preservation
- Novel antimicrobials
- Pathogen/hazard ecology in high-risk food environments
- Industrial effluent characterisation
- Novel/safe/green food processing technologies
- Food safety management systems and behaviours

For its exclusive use the UAFSB 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 from both internal and external sources is available to conduct projects and support current and prospective postgraduate students.

The research done in the UAFSB is categorised under the following sub-groups:

- Bioactive oils
- Food effluent characterisation
- Food safety assessment in health care and traditional environments





Bioactive oils

Dr Ntsoaki Malebo's sub-group specialises in the search for bioactive oils against foodborne spoilage and pathogenic microorganisms. Currently this group is using various techniques such as electron microscopy 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 work done by another member of the 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 masters' 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. Dr Malebo, together with her group, has 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 effluent characterisation

The 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 abattoirs, fruit juice bottling factories and dairies, amongst others. 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 of 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 sub-group 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, while members regularly attend conferences locally and abroad – usually the group sends notable delegations abroad to the International Committee of Food Microbiology and Hygiene.

Food safety assessment in health care and traditional environments:

Ms 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 foodborne 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 1 doctoral, 1 master's and 2 fourth-year students, with Prof. Oriel Thekisoe (University of the Free State) as a participating member. The group also collaborates with the London School of Hygiene and Tropical Medicine in the UK. Research articles that have emanated from the research work of the group are regularly

published in reputable journals and members presents papers at international and national conferences; these include recent visits to the US, Canada and Switzerland. Application for funding has been submitted to the NRF and the group enjoys financial support from MRC and SANPAD.

Other research foci in the UAFSB include:

- Biofilms (Dr Willem Groenwald),
- Maize biotechnology and fermentation (Dr Hanita Swanepoel),
- Entrepreneurial education (Miss Elvina Smith) and
- Antimicrobial adaptation (Mr Ruan Slabbert).



Research Chair in Medical Product Development through Additive Manufacturing and NRF Rated Researcher



Professor Ihar Yadroitsau (Igor Yadroitsev)

Professor Ihar Yadroitsau (Igor Yadroitsev) has more than 30 years of academic experience in applied optics and laser technologies. In July 2015 he was appointed Research Chair in Medical Product Development through Additive Manufacturing at the Faculty of Engineering and Information Technology, Central University of Technology (CUT), Free State, Republic of South Africa.

He has a strong interdisciplinary background and broad experience in the field of physics, material science and engineering, which allows him to comprehend scientific and technical problems with the purpose of finding original solutions in different fields of laser applications. His activity in additive manufacturing began in the middle of 90s in the Institute of Technical Acoustics of the Belarusian Academy of Science. From 2005 to 2013 he worked as Senior Researcher in France, at the National Engineering School of Saint-Etienne, which is a member of the Research and Higher Education Centre of the University of Lyon. In January 2014 he was appointed as Research Professor at the Faculty of Engineering and Information Technology, Central University of Technology, Free State. Since his appointment, he has gone through SA NRF rating process and has been placed in the C category (level C1). Professor Yadroitsau has published more than 120 papers and 1 book; he is the holder of nine patents.

Current research interests include biomedical applications of additive manufacturing (AM); advanced implants by AM; programming and optimising of selective laser melting (SLM) processes; investigation of microstructure samples manufactured by SLM and post-processing of as-built parts; influence of manufacturing process-parameters on mechanical characteristics of AM samples; synthesis of functionally graded and multi

materials by AM; optical monitoring systems as applied to the SLM process; physical aspects of laser-matter interaction.

Since 2015 Prof. Yadroitsau has been the supervisor of four (4) master's students and one (1) doctoral student in Engineering. Their studies are devoted to selective laser melting, residual stresses, heat treatment and mechanical properties of additive manufacturing objects. To involve the students in Material Science studies, to expand their horizons and to be at the forefront of the world's research in the field of additive manufacturing, the new metallographic laboratory at the Department of Mechanical and Mechatronic Engineering was organised.

Prof. Yadroitsau has fruitful cooperation links with other researchers from RSA, Brazil, Sweden, France, Singapore, USA, China, Russia and Belarus. He participated in the Collaborative Programme in Additive Manufacturing, which was granted by the DST. Professor Yadroitsau has been recognised for his research achievements with awards: trophies AFPR 2005, rewarded for developing a process for direct manufacturing of multi-materials parts by SLM technology (France); the laureate of the CLP's (Club Laser et Procédés) prize, Laser Innovation, Academic Prize 2009 (France); CUT VC Excellence Research Awards 2015 in the category: Innovation.

In August 2015, the CUT was awarded a Research Chair under the Department of Science and Technology's South African Research Chairs Initiative (SARChI), the goal of which is to increase the research output and innovation in areas that are considered essential to the country's strategic growth and development. Prof. Yadroitsau is the grant holder of the Research Chair in Medical Product Development through Additive Manufacturing.

Rated Researchers



Professor David P Ngidi

Professor David P Ngidi is a Category C NRF rated researcher, currently occupying the position of Deputy Vice Chancellor: Teaching and Learning at the Central University of Technology, Free State.

His specialisation is in the field of Psychology of Education and key research focus areas are in teacher education, curriculum, attitudes, and personality dimensions.

Over his research career, Prof. Ngidi has contributed more than twenty publications, supervised seven master's and doctoral postgraduate students and presented more than thirty papers at national and international conferences and seminars.

Additional responsibilities related to his research work and career are, amongst others:

National editorial board member: South African Journal of Education (SAJE) (2006-2010).

Consulting Editor: Journal of Educational Review (JER), Nigeria (2008-date).

National editorial board member: International Journal of Educational Development in Africa (IJEDA) (2013-date).

Editorial Committee member: Southern African Journal of Research and Innovation (2014-date).

International editorial board member: African Journal of Pedagogy and Curriculum (2014-date).

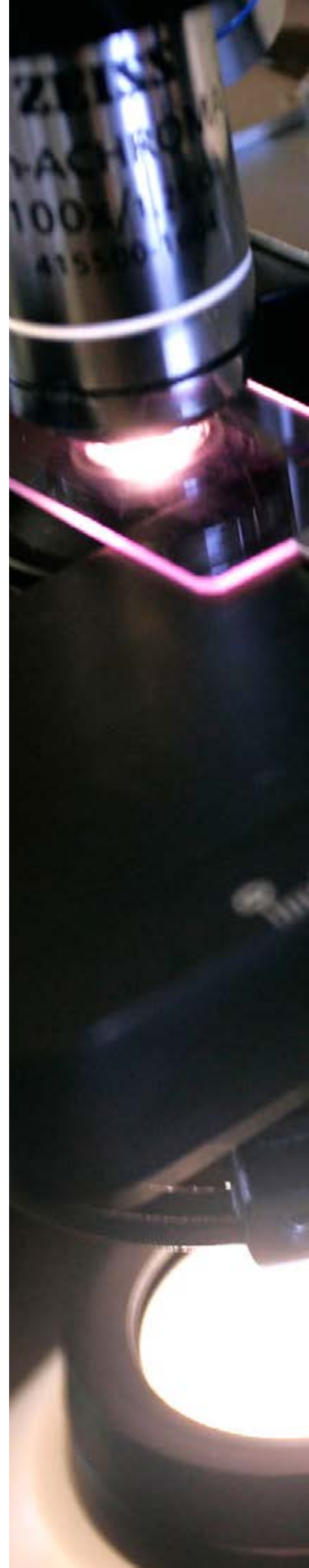
General Secretary and Treasurer: Southern African Society for Education (SASE) (2006-date).



Professor Alfred Beati Ngowi

Professor Alfred Beati Ngowi is a C2 NRF rated researcher currently occupying the position of Acting Deputy Vice Chancellor: Research, Innovation and Engagement at the Central University of Technology, Free State. He is a registered professional construction project manager (Pr.CPM), member of the Botswana Institute of Engineers (BIE); Member of the Institution of Engineers, Tanzania (MIET); Member of the Chartered Institute of Building (MCIOB); and member of the International Association of Housing Sciences (IAHS). His research interests are multi-disciplinary and they include engineering, the built environment, human capital, strategic management and performance management with an extensive record in human capacity development, having produced technicians and degree graduates as well as supervising 21 master's and doctoral students. Some of these students have proceeded with doctoral studies at leading universities such as MIT and Princeton in the USA and Cambridge in the UK. He has published over 100 papers in journals, proceedings and book chapters.

He is also a co-chief editor of the Journal of Construction in Developing Countries (JCDC); an associate editor of the Journal of Built Environment and Asset Management (BEPAM); and a reviews editor of the Botswana Journal of Technology (BJT). Currently Prof. Ngowi's research effort is geared towards embedding sustainability in all construction activities, starting from planning and procurement, to execution on project sites. Specifically, work has been carried out regarding how construction firms could benefit from the Sustainable Development Goals (SDGs) in general, and how firms could create competitive advantage by embracing sustainable construction in particular. Future work will ensure that the approach used in developing construction firms takes cognisance of creating an environment that shows the firms embracing the attributes of sustainability, particularly sustainable construction leading to a competitive advantage.





Professor Laetus O.K. Lategan

Professor Laetus O.K. Lategan is currently the Director: Research Development and Postgraduate Studies at Central University of Technology, Free State. His research outputs have been commended with a C Rating from the National Research Foundation (NRF) and the awarding of an extraordinary professorship in research and professional ethics at the University of the Free State (2007-2010). His research contribution goes beyond own research activities. He currently acts as founding editor of the Journal for New Generation Sciences, a Department of Higher Education and Training accredited research journal. His current research interests centre around three themes: Medical

humanities, Research ethics and integrity and How to educate a new generation of researchers:

As researcher he has an extensive research publication list comprising almost 200 publications as author or co-author (ranging from accredited articles, chapters in books, published conference papers, monographs, books, chapters in books and public intellectual comments) in various fields of study (philosophy, ethics, higher education, research education and research management). His professional qualifications are at doctoral level in philosophy and theology.



Professor Isaac Ntshoe

Professor Isaac Ntshoe is a C-rated researcher currently occupying a position of Research Professor in the Academic Development and Support and the leader of the Unit of Research in Scholarship of Teaching and Learning. His research extends and complements the research area on curriculum design, higher education policy and planning, the sociology of knowledge and the economics of education. Prof.

Ntshoe has numerous publications and has supervised several master's and doctoral postgraduate students. His research focuses on investigation into curricula design and pedagogical practices in the professional and sectoral fields of practice offered by traditional universities and universities of technology, and technical and vocational education and training (TVET) institutions.



Professor Ryk Lues

Professor Ryk Lues is a C-rated researcher and currently Full Professor in Food Safety in the Faculty of Health and Environmental Sciences at the Central University of Technology (CUT), Free State, South Africa. He is the Director of the Centre for Applied Food Safety and Biotechnology (CAFSaB) and Coordinator of the Regional Innovation Forum for the Free State Province, an entity mandated to facilitate discourse amongst various academic, business and regulatory stakeholders in the regional innovation value chain.

He holds an MSc (Microbiology) and a PhD (Food Science) from the University of the Free State and his field of specialisation comprises social-

behavioural aspects impacting on food microbiology and hygiene. He also has an interest in organic acid preservatives and microbial acid tolerance. His research into food safety behaviour has seen him being invited to a number of industries both within and outside the food sector to speak on issues related to risk, organisational culture and motivation. He is an NRF-rated scientist and has to date authored 67 articles in ISI accredited journals, 3 book chapters and 1 book on topics related to research methodology, food preservation, food safety culture and food hygiene systems management.



Dr Rambe Patient

Dr Rambe Patient is a C2 rated researcher and holds a PhD in Educational Technology from the University of Cape Town, South Africa. He holds the position of Senior Researcher in the Faculty of Management Sciences at the Central University of Technology, Free State in South Africa. Dr Rambe is also a Convener of the Masters and Doctoral Programme Stream at the same university. He has

previously served as a Postdoctoral Research Fellow and Assistant Director in the Office of International Academic Projects at the University of the Free State, South Africa. His research is widely acknowledged and is rated by the National Research Foundation of South Africa. Area of research interest (Emerging technologies and SMMEs, social media and HE, MOOCs in HE)





Professor Arthur James Swart

Professor Arthur James Swart is a Y rated researcher currently occupying the position of Associate Professor in the Department of Electrical, Electronic and Computer Engineering. His key performance areas include teaching Electronic Communication and research into engineering education. His research focus area on metrology is one of his fields of specialisation where he measures different photovoltaic module parameters in order to verify the application of the module within specific environments.

These parameters include tilt and orientation angles, photovoltaic module voltages, currents and temperatures. The objective of this research is to try and optimise the output power of a given photovoltaic module for different electrical and environmental conditions. Most of his recent research

in this field has been done with Dr Pierre Hertzog, a colleague in the department. Engineering education is his other field of specialisation, where he focuses mainly on the use of educational technology to help fuse theory and practice for engineering students in higher education. Throughput rates remain low in higher education, which mandates academics to search for innovative methods to help students demonstrate the right graduate attributes that are required by industry today. He considers himself privileged to be part of a research group in Engineering Education (ARGEE) within the faculty; this group has published 5 accredited journal articles and presented 15 international conference papers over the past two years





Professor Elmarie van den Heever-Kriek

Professor Elmarie van den Heever-Kriek is a C-rated professor of Clinical Technology and an NRF rated researcher since 2012. Her primary research fields include medical science and systems, disease control and health sciences. Clinical technology is divided in seven specialisation fields namely: Cardiology, Pulmonology, Perfusion, Nephrology, Reproductive, Neurophysiology and Critical care. Due to the nature of the programme her research involvement is extremely diverse, covering all seven specialisation fields as displayed in her publication list. However, her core research areas and interests are HIV and cancer (especially throat and breast cancer). Prof. Van den Heever-Kriek has published over 35 scientific papers in peer-reviewed journals, presented over 50 papers at international and national conferences and continues to review manuscripts for accredited

scientific journals. She has successfully supervised over 25 masters' and 7 doctoral students and has also mentored two post-doctoral research fellows. During her academic career she has received various academic awards. In 1998, she received the Junior Ernst Oppenheimer Memorial Trust medal for her PhD project proposal and in 2000 the Struwig Germeshuysen Trust award for cancer research. In 2001, the South African Association for Woman Graduates awarded her for her contribution towards cancer research. In 2001 she was nominated by the Japanese Government to attend a 4-month course in advanced microbial enzyme technology, in Japan. The Central University of Technology, Free State also awarded her with the vice-chancellor's medal for best researcher in 2005 and 2010.



Post-Doctoral Fellows



Dr Matthew C. Achilonu

Dr Matthew C. Achilonu is a post-doctoral research fellow at the Department of Agriculture, Faculty of Health and Environmental Sciences, Central University of Technology, Free State. He received his doctoral degree in Chemistry from the University of the Free State in 2009. His other degrees are: M.Sc. in Polymer Science and Technology (with distinction/*cum laude*), and B.Sc. Tech. in Industrial Chemistry were both obtained from the Federal University of Technology, Owerri, Nigeria in 1989 and 1994 respectively. Dr Achilonu's bachelor's degree research was on extraction and purification of *Furfural* from agricultural wastes (rice husks). His master's degree research focused on grafting of acrylamide onto gum *Arabic* macromolecules to produce modified biopolymer.

Dr Achilonu's focus areas of current research are:

- Utilising biologically active phytochemicals in animal diets: investigating their modulatory effects and possible use as a replacement for the synthetic antibiotics, hormones and growth promoters in poultry species.
- Chemical modification of renewable agricultural wastes to a biodegradable biopolymer for wastewater remediation. About eight postgraduate students are working on these ideas under his supervision/co-supervision.

Specialisation

Bioactive phytochemicals in animal diets: In this field of study, Dr Achilonu focuses on pumpkins (*cucurbitaceae*), which are known to display a wide range of biological activities. Hence, the growing interests by farmers in using them as feed additives to fortify animal feeds.

Dr Bankole Osita Awuzie, PhD, received his doctoral degree in Built Environment from the University of Salford, UK in 2014. Prior to this, he had obtained an MSc degree in Construction Project Management from the Robert Gordon University, Aberdeen, Scotland, United Kingdom and a BSc (Honours) degree from the Imo State University, Owerri, Nigeria in Real Estate Management. He also has experience working in the construction and the facilities management sectors, both in Nigeria and the United Kingdom. Currently, he is a post-doctoral scholar at the Central University of Technology, Free State, South Africa. His research interests consist of the following: strategic procurement; socio-economic sustainability; infrastructure asset delivery and management; and sustainable development in higher education, especially as it pertains to infrastructure assets delivery and management within the campuses of higher education institutions. His research is a joint or MIT project on sustainability between the faculties of Management and Engineering, Information Technology.



Dr Bankole Osita Awuzie

Dr Bankole Osita Awuzie, PhD, received his doctoral degree in Built Environment from the University of Salford, UK in 2014. Prior to this, he had obtained an MSc degree in Construction Project Management from the Robert Gordon University, Aberdeen, Scotland, United Kingdom and a BSc (Honours) degree from the Imo State University, Owerri, Nigeria in Real Estate Management. He also has experience working in the construction and the facilities management sectors, both in Nigeria and the United Kingdom. Currently, he is a post-doctoral scholar at the

Central University of Technology, Free State, South Africa. His research interests consist of the following: strategic procurement; socio-economic sustainability; infrastructure asset delivery and management; and sustainable development in higher education, especially as it pertains to infrastructure assets delivery and management within the campuses of higher education institutions. His research is a joint or MIT project on sustainability between the faculties of Management and Engineering, Information Technology.





Dr Hanita Swanepoel

Dr Hanita Swanepoel (née Theron) is the current post-doctoral research fellow at the Centre of Applied Food Security and Biotechnology (CAFSaB) at the Department of Health Sciences, Faculty of Health and Environmental Sciences, Central University of Technology. She aims to assist the maize milling industry with solutions towards the utilisation and value addition of some of their by-products, such as the fines. Through her research, she wants to provide strategies and solutions to the milling industry to compete by increasing the demand for maize and thereby contribute to the sustainability of the milling industry. Dr Swanepoel worked full-time at Continental Beverages in Bloemfontein, initially as Product Development Manager and after a promotion as Technical Manager (responsible for Product Development and Quality Control Assurance). Her research experience was vital and she managed to solve numerous problems, either in production or in the final product ensuring safe, stable and high quality products. She did the development for new innovations on the flagship brand, namely Wild Island and other variants such as Super Fruit and the other concentrated beverages.

Specialisation: Research and Development (R&D) in Food Science with the focus on food safety (including food safety systems and product shelf life) and food security (reduction of waste during product development and the use of waste or by-products).

Key performance areas: R&D using the by-products from the milling industry. Recipe development for products such as cookies and beverages and different experiments has been done to find a solution to utilise the fines as carbon source for fermented beverages.

The establishment of a fermentation laboratory which involves the management, planning and approvals for this laboratory with the various role players such as the architect, quantity surveyor etc. It also includes the budgeting, control of expenses and procurement of the equipment, raw materials, etc.

The development of relationships with internal partners (e.g. PDTs and REGMS) and external industry and government partners such as DESTEA, Pioneer Foods, OVK, SAB, Entecom and the International Labour Organisation (ILO) amongst others.

Dr Swanepoel currently supervises 3 x master's students and co-supervises 1x master's and 1x doctoral student.

Reviews articles from peer-reviewed journals and theses from other institutions on an ad hoc basis.

Lectures Aroma Chemistry to the 3rd year Somatology students and annually organises an industry visit for the B.Tech Food Hygiene students.



Dr Ina Yadroitsava

Dr Ina Yadroitsava has been a postdoctoral fellow in the Department of Mechanical and Mechatronic Engineering in the Faculty of Engineering and Information Technology at the Central University of Technology, Free State since 2014. She is furthermore an established researcher with over 20 years of academic experience in physics, mathematics, statistics and life sciences. Her research interests include physical aspects of laser-matter interaction, numerical simulation, investigation of microstructure and stresses in the samples manufactured by additive manufacturing, design of experiments, quality and process-control. Dr Yadroitsava, holds one (1) registered patent, has also contributed over eighty (80) publications in various academic journals and has participated in numerous conference proceedings. Dr Yadroitsava is a co-supervisor of one (1) doctoral and four (4) master's postgraduate students.

Since 2015, her research has received support from the South African Research Chairs Initiative of the Department of Science and Technology and National Research Foundation of South Africa, and Collaborative Programme in Additive Manufacturing.

Her main research interests and fields of expertise include:

Physical aspects of laser-matter interaction, numerical simulation

Investigation of microstructure samples manufactured by selective laser melting, laser cladding and cold-spray coating, analysis of the quality of samples

Statistics, design of experiments, quality and process-control

Analysis of physical properties of powders.

H-INDEX: 5 by Scopus (<http://www.scopus.com/authid/detail.url?authorId=36906324000>) and Google Scholar (<http://scholar.google.co.za>)





Dr Khajamohiddin Syed

Dr Khajamohiddin Syed is a postdoctoral fellow at the Department of Health Sciences, Faculty of Health and Environmental Sciences, Central University of Technology, Bloemfontein, Free State. Dr Syed completed his M.Sc. in Biochemistry, receiving a gold medal, and a Ph.D. at Sri Krishnadevaraya University, Andhra Pradesh, India. During his doctoral studies he published three articles in high impact-factor journals and made presentations at various conferences, including the Society of Biological Chemists, India. After his doctoral studies he worked as postdoctoral research associate at the University of the Free State, Bloemfontein, South Africa (2006-2009) and then moved to the University of Cincinnati, Ohio, USA as a visiting faculty member (2009-2013).

Dr Syed as academician enjoys lecturing and supervising students. At present he is teaching Biochemistry IV for B Tech students. Currently, he supervises quite a number of doctoral (6), and master's (17) students.

Dr Syed's research is focused on Cytochrome P450 monooxygenases (P450s), heme-thiolate proteins present in all living organisms. Research specifics include (i) genome wide data mining and their annotation; (ii) structure-function analysis; (iii) evolution; and (iv) applications. Dr Syed's research work has been published in highly ranked peer-reviewed scientific journals, including Science and PNAS, USA. For more information on his research articles, please visit Google scholar webpage: <http://scholar.google.com/citations?user=9SX649AAAAAJ&hl=en>.

Dr Syed's research achievements were highlighted in the University of Cincinnati Newsletter, Cincinnati, Ohio, USA and also in Research and News Letter, Central University of Technology (CUT), Bloemfontein, South Africa. He has been an invited speaker at both national (South African) and

international conferences. Dr Syed carries international recognition in P450 research as it evident from national and international invited talks and his research index as shown as of 01 April 2016: Google scholar – total citations: 899; h-index: 13; i10-index: 15 (<https://scholar.google.com/citations?user=9SX649AAAAAJ&hl=en>) and Researchgate score: 27.00; Impact points: 116.52 (https://www.researchgate.net/profile/Khajamohiddin_Syed).

Recently, Dr Syed's group identified a novel drug target against Oomycete pathogens. The discovery of novel P450 fusion protein as drug target was aired on South African news channels and in newspapers (<https://www.youtube.com/watch?v=VbOdUMTsEyc&feature=youtu.be>).

Dr Syed serves as editorial board member and reviewer for reputed international scientific journals. He is an active member in microbial genome sequencing projects carried out by the Joint Genome Institute (JGI) of the Department of Energy, USA. Dr Syed is involved in research collaboration with high-profile researchers from various countries, including the USA, UK, Canada, Europe, Japan, India and South Korea.

Since he joined the CUT (July 2013), Dr Syed has successfully established a molecular biology laboratory and a bioinformatics laboratory with Prof. Samson Sitheni Mashele. Currently, Dr Syed holds a major research grant from the Technology Innovation Agency (TIA), South Africa. Dr Syed has been a key member in establishing the Unit for Drug Discovery Research at CUT (<http://centerfordrugdiscoveryresearch.weebly.com/>) and he is also the creator of South African Cytochrome P450 Researchers (SACPR) community website. For more information on this society please follow the link: <http://sacpr.weebly.com/>.



RESEARCH IMPACT AND EXCELLENCE

PART 4

Stats at a glance

Funding

- R 42 m funding available for funding from CUT, DHET and NRF.
- R 18 722 452 funding awarded to 444 students (Postgraduate to Master's, Masters and Doctoral students).
- R 3 519 000 funding available for staff from DHET R&D Grant for capacity-building, including to improve qualifications.

Postgraduate Students

- 590 Postgraduate to Masters (3.75%),
- 130 Master's (1.84%) and 49 Doctoral students (1.4%) of total enrolment.
- This represented a total of 6.63% of the total enrolments.
- 53 M Degrees and 19 Doctorates awarded
- 79 Staff as students benefitted from DHET R & D grant to improve qualifications.

Training/Workshops

- Three workshops presented (Bloemfontein and Welkom campus) and one seminar series on postgraduate supervision. A cumulative total of 314 staff and students attended.

Research Outputs

- Research publication outputs grew with 22% from 2014-2015. In 2015 106.48 credit units were awarded to the university.
- The university had 2 Research Centres, 12 Units and 7 Groups.
- Nine rated Researchers in 2016.
- Five postdoc scholarships for 2016.

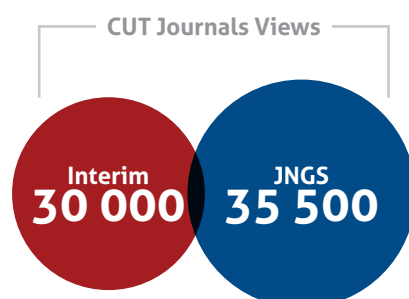
CUT Journals

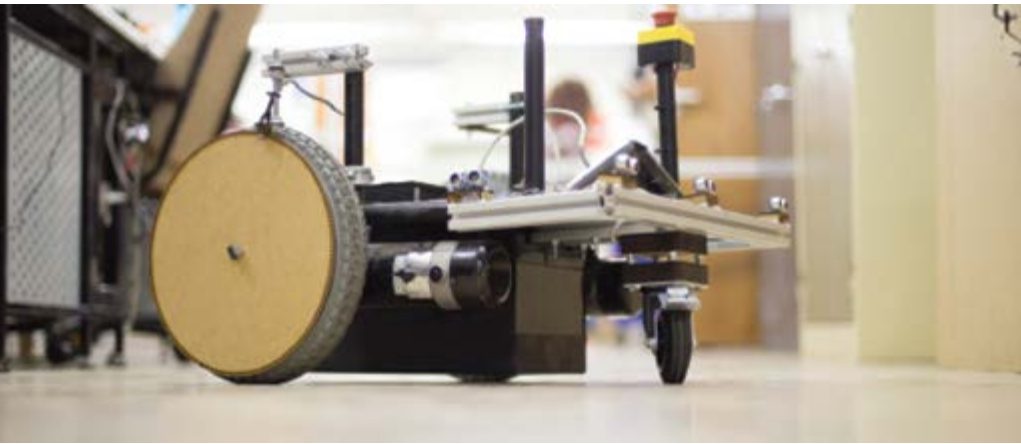
- Interim had collective almost 30 000 views and downloads.
- The JNGS had collective more than 35 500 views and downloads.

53 × M Degrees awarded

19 × Doctorates awarded

+22% Research Publications





Inaugural Address

Professor Herman Vermaak is currently a Professor and Assistant Dean: Research, Innovation and Engagement in the Faculty of Engineering and Information Technology: Department of Electrical, Electronics and Computer Engineering. He was Head of the Department for eleven years and Acting-Dean of the Faculty for fourteen months. He has presented numerous papers at international conferences, published widely in international journals, and supervised twenty-eight completed post-graduate studies. He has also produced two technical reports for Council for Scientific and Industrial Research (CSIR) on Reconfigurable Assembly Systems.

Prof Herman Vermaak was inaugurated as a full Professor on 07 September 2016. His address was a summation of his prowess as a scholar of note in the field of engineering. In his address, he presented on *Design-for-Testability: Design-for-Testability: the solution to improved test engineering and product quality* as a tribute of his work of many years as Artisan, Technologist and Engineer. His presentation was based on issues such as the importance of testing, digital circuits, design-for-testability, virtual commissioning, condition monitoring and the future of testing, and how they all fit to one another. The main purpose for testing is to ensure that all equipment is working according to the standards of what it's designed for and that it is reliable and operating according to its specifications.

Testing becomes a major activity in any developing life cycle. Testing is important in every piece of equipment that goes into the designing and manufacturing of a complete product. To determine when testing can take place depends on the type of media or circuit being tested. If it is in a design, then testing will happen in the beginning and will carry on throughout. Design-for-testability is a design technique that makes the system easier to test. A fault is testable if there is a well specified

procedure to explore it, which is implementable with a reasonable cost using correct techniques. A circuit is testable with respect to a fault set when each of those faults in the set is testable. Design for delay testability automated test equipment are lagging with operations speed as they are designed with yesterday's technology to test today's technology which is not working, we need to develop a technique to detect a very small delay faults in digital circuits. Other aspects that he mentioned include Virtual commissioning with design for testability as a technique used when developing a system without having hardware and Conditioning monitoring that can sense what is happening and provide data of process indicators when applied in an automated environment. For future of testing, we are looking at utilizing smart technology like internet of things, testing Silicon smart cut, smart manufacturing test bed and robotic systems.



Prof Herman Vermaak
Assistant Dean
Faculty of Engineering and
Information Technology

Appointment of Professors

The following new professors were appointed as from 1 July 2016

Professor



Professor DY Dzansi
Entrepreneurship



Associate Professors



Professor K Syed
Biomedical Technology



Professor PE Hertzog
Electrical Engineering



Professor E Theron
Civil Engineering



Professor MM Mostafa
Civil Engineering



Professor DK Das
Civil Engineering



Professor JW Badenhorst
Education Studies

National Winner Women in Science Awards - Dr Muthoni Masinde

Dr Muthoni Masinde, top researcher, senior lecturer and head of the Information Technology Department, with teaching experience at university level spanning over 16 years walked away with honours at the annual Women in Science Awards (WISA) for her innovative tool that can accurately predict drought-stricken environments for the farming sector.

The tool taps into African indigenous knowledge of natural disasters and augments it with ICT such as artificial intelligence, wireless sensor networks, and mobile phones. This contribution was recognised by the International Telecommunications Union and emerged in the top five in the Union's Green ICT Application Challenge. Dr Masinde's contribution to drought forecasting solutions for the Free State was recently featured on the BBC World Service and led to the establishment of a unit at the Central University of Technology, Free State (CUT) for research on informatics for drought in Africa. Since she became head of department in 2013, the number of staff members enrolled for or in possession of higher degrees doubled and, through an elaborate research strategy that she developed, the department's research output increased from two to over 15 articles a year. The department's postgraduate enrolment increased from three to over 20 students a year, and for the first time in the history of the department, between 2014 and 2016 she recruited three doctoral students, one of whom will receive his degree in September 2016.



She has supervised eight master's students and is currently supervising another 12, with four due to complete their degrees by the end of 2016. She has published seven journal articles, three book chapters and 26 papers in peer-reviewed conference proceedings in the past five years. She is also a reviewer of six journals and conference proceedings, as well as an external examiner of master's and PhD theses for four local universities (CPUT, UCT, UJ and UWC) and two non-South African (Makerere University in Uganda and the University of Nebraska in the US) universities. Masinde was behind the formation of CUT's Association for Women in Engineering and Information Technology. She is also an active member of the Association of South African Women in Science and Engineering.



Through an elaborate research strategy that she developed, the department's research output increased from two to over 15 articles a year.





Regional collaboration – A new hope for heart diseases

A regional collaboration between CUT and the University of the Free State (UFS) brings hope to heart disease patients in Africa. CUT and the UFS are embarking on a new collaboration that will provide and advance universal access to cardiac surgical services mainly in Africa and the world in general. A team from the two universities led by Prof. Francis Smith, Head of Robert W M Frater Cardiovascular Research Centre in the Department of Cardiothoracic Surgery at UFS and Mr Gerrie Booysen, Director of the Centre for the Centre for Rapid Prototyping and Manufacturing (CRPM) at CUT, has developed a new polyurethane heart valve that will help treat rheumatic valvular disease- a disease that continues to affect mainly over two million people in the Sub-Saharan region, China and Latin America. This is seen as the beginning of an exciting phase of collaborative development between the UFS, CUT and Stellenbosch University. For years, doctors across the continent have been battling to come up with solutions for younger patients requiring heart valve replacement with a choice between a mechanical valve, requiring lifelong anticoagulation therapy and a biological valve (not requiring anticoagulation). This polyurethane valve is a new innovation in the medical field and was made possible by the University's School of Medicine.

The valve does not require anticoagulation and might be an ideal solution for the young African patient. The collaboration in its five-year plan is to deliver a

service to our community through manufacturing of implantable patient-specific prostheses as requested by medical practitioners. The valve has a titanium frame (which is 3-D printed by the CRPM) and then dips moulded using locally designed moulds and an automated dip moulding process developed at CUT. Prof. Francis Smit in collaboration with the CRPM at CUT, which specialises in Additive Manufacturing, while the Mechanical Engineering Department at the University of Stellenbosch will be focusing on computational fluid dynamics and finite element modelling.



Winner of Tata Fellowship Programme and Special Award Women in Science Awards - Ms Mpho Mbele



* An elated Mpho Mbele with Minister of Science and Technology, Ms Naledi Pando at the WISA Awards Ceremony.

Ms Mpho Mbele is a Master's student and part-time lecturer in the Department of Information Technology at Welkom Campus. Mpho made CUT proud at the Women in Science Awards when she walked away with Tata Fellowship Programme and Special Award from the Department of Science and Technology for her outstanding academic research abilities on Indigenous Knowledge. Her research was based on integrating local with scientific knowledge regarding environmental pollution caused by mine waste in Lejweleputswa district. She won herself a sponsorship from TATA to advance her studies further in research, acquire more knowledge

and publish papers on her work. For this year, Mpho intends buying all the relevant equipment that will allow me to advance my research and the remaining money will go towards my tuition fees next year.

Mpho Mbele was among a new breed of scholars under the leadership of Dr Muthoni Masinde; pursuing her research work on integration on indigenous and scientific knowledge. Ms Mbele's secret recipe to success is simple- dedication, passion and hard work. Ms Mbele was also featured in Mail & Guardian, the New Age, City Press, SABC 2, and Soweto TV.

Passionate About Indigenous Knowledge - Dr Ntsoaki Malebo



Doctor Ntsoaki Joyce Malebo is a National Research Foundation Career Advancement fellow, currently appointed as senior lecturer and head of department in the department of life science at the Central University of Technology in South Africa. Her research interests lie in the fields of microbiology and food safety, particularly the use of plants-based oils as alternatives antimicrobials against antimicrobial-resistant food-borne pathogens. She is also passionate about research that links the "Western knowledge" with African indigenous knowledge systems. She believes that knowledge should be shared and skills should be transferred in order to have successful researches and to empower knowledge holders within communities. So little of indigenous knowledge has been incorporated into

mainstream education and research, so her objective is to see indigenous knowledge incorporated into mainstream "research and knowledge".

She has successfully supervised master's students and currently supervises master's and doctoral students. Doctor Malebo has more than 10 publications in international journals and has presented her work at more than 30 local and international conferences. She is married and has two beautiful daughters. She has been featured in the Department of Science and Technology (DST) African Researchers Booklet which showcases role of researchers in supporting African researchers undertaking ground-breaking research to address Africa's challenges and the promotion of science, technology and innovation in Africa.



Winners of the Vice Chancellor Awards Research and Innovation

CUT hosted its annual Vice-Chancellor's Excellence Awards on 27 October 2016. The main objective of the awards is to acknowledge the exceptional performance of staff members for their sustained and outstanding achievement in research, innovation, teaching, curriculum innovation, and community engagement activities which are aligned with the university's vision. In his address at the award function, Prof Henk de Jager, Acting Vice-Chancellor and Principal defined excellence as a talent or quality which is good and surpasses ordinary standards. He further said that excellence is continuously moving target that can be pursued through actions of integrity and being the forerunner in terms of products, services or outputs.

The award winners for research and innovation 2016 were all from the Faculty of Engineering and Information Technology and are:

- Dr Muthoni Masinde, recipient of Innovation award.
- Dr Kanzumba Kusakana, recipient of Early Career Research award.

Book Authors



Prof. Marin Maina Maringa

Prof. Marin Maina Maringa (PhD, CEng and MIMechE) is a Professor of Mechanical Engineering with research specialisation in thermoelastic stress analysis, composite engineering materials and materials characterization; areas in which he is widely published. His research book entitled '*The Elastic Behaviour of our Dual Moduli Materials in Bending*', which he said his motivation for publishing it was to share his research findings with the wider audience to generate more research on the property of some materials. He has lectured and undertaken research at tertiary level institutes and at universities for 24 years, while an academic member of staff in the Department of Mechanical Engineering at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) in Juja, Kenya; in the Department of Mechanical Engineering of the Kigali Institute of Science and Technology (KIST), Kigali, Rwanda; and in the Department of Mechanical and Mechatronic Engineering of the Technical University of Kenya in Nairobi, Kenya. Maina served as the founding Vice Principal initially in charge of Administration, Finance and Academics at the Integrated Polytechnic Regional Centre (IPRC) Kigali, in Kigali, Rwanda and was the founding Acting Deputy Director General of the Rwanda Workforce Development Authority. He has also served as the Head of the School of Engineering Science and Technology

and Acting Executive Dean of the Faculty of Engineering and the Built Environment, both within the Technical University of Kenya in Nairobi, Kenya. Early in his career, Maina worked as an operations and maintenance engineer cum manager in the hydro power generation sector in Kenya, following a one-year intensive training program in thermal, geothermal, hydro and diesel power generation plants, electric power transmission distribution systems, system control and switchgear testing service, maintenance and repair. Prof Maringa serves as a Chief Editor, member of editorial board and referee for 17 journals internationally, has been an assessor of the Institute of Mechanical Engineers (UK), for the for the East African region, and a visiting Professor at the Vaal University of Technology in South Africa. He is presently based at the Central University of Technology also in South Africa.





Prof YE Woyessa

I would like to start by saying that this book-writing project has been quite an experience and a journey well-travelled. From the beginning, it requires a clear set of questions to start with on various issues, such as why this book? What is that need to be written? How should it be written? Who are the audiences? etc. Therefore, the first thing to do was to come up with the structure of the book, i.e. skeleton or outline based on the expectation of the book readership and its application. Given CUT's involvement in the OECD assessment of city regions and higher education institutions sometime in 2011, we thought of adding value to this effort by writing this book on regional innovation. The feedback from one of the reviewers mentioned the lack of such materials (as textbooks) for teaching purpose in universities in the field of regional planning and we were happy we could fill this gap. The

learning experience from this exercise, like any project, is time management.

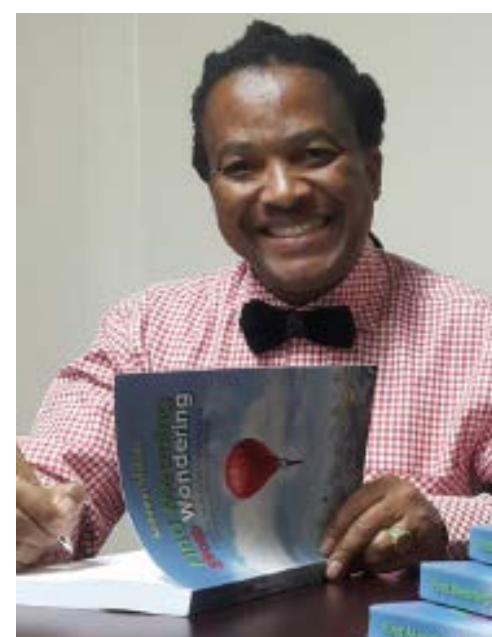
Moreover, it requires patience and discipline when trying to navigate between the main and daily tasks at work place and this book writing, which is almost like an add-on activity that need to be done during off-hours and weekends.



Dr Solomon Makola embraces his passion for writing

A proud moment for Dr Mokala during the signing for his book, "Find Meaning, Stop Wondering". This compelling read is not only for those interested in Logotherapy, but also for the public and student. His second publication titled 'Pimp the pain: Purpose Inspired Dialogues' was commissioned for production by Unisa Press and will be available in a few months. Dr Makola is currently working on two other

books simultaneously, "God prefers Fruit Salad for Dessert", that deals with archetypal characteristics and also "In Memory of Her", which is a psycho-autobiography of the significant roles women played in a man's life. His current book is available from Unisa Press or reputable book stores. Few signed personal copies are also available from the author on first come first serve basis.



Visiting the Top Hotel Schools in the World

As part of her doctoral studies, Mrs Dalene Crowther, HoD for the Hospitality Management Department, Faculty of Management Sciences, had the opportunity to visit four of the top ten best Hotel Schools in the world. The aim of her doctoral studies is to develop sustainable financial

management strategies for South African University of Technology Hotel Schools. During her meetings, she gained valuable insights into how these top Hotel Schools balance their operational, educational and financial roles.



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1 - Dalene Crowther & Mr Dimitrios Diamantis, Dean of Graduate Studies at Les Roches, International School of Hotel Management.

2 - Dalene Crowther & Mr Fabien Guimrandy, Chief Financial Officer, Ecole Hotelier Lausanne.

3 - Dalene Crowther & Mr Laurent Schatzmann, Head of Marketing & Development Africa & Middle-East Swiss Education Group.

4 - Dalene Crowther & Mr Rob Risseuw Dean at Hotel School, The Hague.



Higher Education Academy Research Project: Liverpool Experience

Dr Ben Kotze

Dr Ben Kotze was involved in a Higher Education Academy (HEA) research project aiming at enhancing teaching and learning in the area of cyber security. The project was an open access MOCK-style learning platform enabling the delivery of interactive learning content covering essential cryptographic algorithms and their application in security protocols using game technology. He worked as part of a team, involving two Professors and three researchers.

Dr Ben Kotze participated in 3 hours per week, teaching activities in game technology, computer programming and supported the teaching staff.

Dr Ben Kotze attended weekly research seminar presentations from LJMU researchers as well as from external speakers including with external business partners in the computer industry in UK, one of them Sensor City. Dr Ben Kotze had the opportunity to deliver one seminar about his research at Central University of

Technology; and about his research at LJMU during his visit. He also visited Liverpool University.

Dr Ben Kotze was involved in weekly meetings with Prof Abdennour El Rhalibi and his PhD students to learn about supervision practices at LJMU. Dr Ben Kotze also had the opportunity to meet on a weekly basis members of the Computer Games Research Group at the Protect Research Centre to learn about their activities.

This whole project and collaboration was sponsored by the AESOP+ part of Erasmus Mundus program.



- 1 - Campus map as LJMU is scattered in Liverpool city center.
- 2 - Well known Lambanana statue in front of main entrance Tithebarn Building
- 3 - Pictures of Dr Kotze as a member of staff during November



PhD Mobility Grant: Belgium Experience

Prof Lize Theron

During 2016 Prof Theron participated in the Erasmus Mundus South Africa EU-SATURN grant agreement. It was a 6 month PhD mobility grant between the Newcastle University and the CUT. The university is situated in the city of Newcastle upon Tyne on the River Tyne in northeast England. The seven bridges that unites Gateshead and Newcastle are of the most stunning civil engineering structures in the world especially the Millennium Bridge which is both a pedestrian and cycle bridge that links the two waterfronts. With more than 8000 students, 1200 staff the university is one of the biggest faculties in the UK working across science and engineering. I worked alongside other researchers in the department of Civil Engineering and geosciences, which are one of the UK's leading groups working within the built and natural environments. My supervisor was Prof Arya Langroudi.

Project scope: The focus was to build on the hypothesised association of carbonates' polymorphs with environment's pH and enhance the understanding of carbonates' role in soil volumetric changes. The emphasis was on placing intelligent controls into soil for the ground to 'self-evolve' to an 'intended' state. Outputs of this research can now be used to develop novel low-viscosity grouts (i.e. compensation grouting) as well as proppant-free ground engineering strategies, mitigation of mineral dissolution and sinkhole formation.

Professionalization of Higher Education Management – Bath University

Globalisation processes are affecting higher education institutions significantly and hence the importance of capacity building programme to provide opportunities to higher education professionals, management and administrative staff to develop and provide expertise needed for effective, transformed, modern universities in a national and global context. As part of a DHET funded initiative between Bath University in the United Kingdom and Nelson Mandela Metro University three CUT employees namely; Ms Magauta Kenke (Psychologist – Wellness Centre) and Ms Edith Sempe (Deputy Director: Research Development and Postgraduate Studies and Mr Ike Mokhele) are part of a group of staff as postgraduate students from different Higher Education(HE) institutions in South Africa enrolled towards a professional Doctorate in Business Administration (Higher Education Management) with Bath University.

Ms Kenke and Sempe recently spend a week at Bath University for their second residential and Mr Mokhele will be attending in 2017. Although focus of the residential was on key policies affecting HE it was clear that doctoral education is not only about the thesis – *intended benefits of post-doctoral student experience* include interaction with experts in the field of HE, training on scientific writing, research methodologies



and quantitative analysis, publication of papers in accredited journals, participation in seminars by players in government, funding agencies, industry and education sector on real issues and roles played by HE, for example “The contribution of HE to peace” and “Universities and Business Innovation”. Throughout the residential the most significant take home message was the proactive role taken by universities internationally through research to resolve and/or intercede in challenges faced by both the public and private sector and also recommend opportunities for development.

The programme also provide additional benefits, these include but not limited to opportunities to benchmark and compare best practices in professional services globally within HE sector, networking with students and other key role players both nationally and internationally, stepping stone towards building one’s research career and also enhancing the understanding of HE management and research process within one own institution. Finally, likewise there is an opportunity for cultural excursions and travel!





FACULTY ENGINEERING AND INFORMATION TECHNOLOGY

PART 5



A message from the Dean

The Central University of Technology (CUT), Free State, vision 2020 has a strong emphasis on social and technological innovations. These innovations must contribute to the sustainable development of the communities and societies primarily in the central region of South Africa. The role of higher education in regional development has been well documented. Particularly, research in engineering, built environment and information technology plays a vital role in the transformation of peoples' lives and the environment we live in. As South Africa is striving for improved economic growth, energy and water security are found to be some of the major constraints that may hamper sustainable growth and development.

Recognising the challenges faced by communities and societies at regional and national level, the Faculty of Engineering and Information Technology has endeavoured to engage in various areas of research with the aim of contributing to the sustainable development of the country. In 2016, the increase in the level of research outputs and productivity was very significant and testament to the Faculty's commitment towards achieving vision 2020. It must be pointed out that this increased research outputs were the result a concerted effort by the Faculty in the creation of a research culture over the past two years creating a vibrant community of academics and researchers.

The Faculty will continue to build on the current success with a focus on collaborating with national and international institutions with the aim of raising external funding, knowledge exchange, and sharing of experiences involving both staff and post-graduate students.

As South Africa is striving for improved economic growth, energy and water security are found to be some of the major constraints that may hamper sustainable growth and development.



Prof YE Woyessa
Acting Dean: Faculty of Engineering
and Information Technology



A message from the Assistant Dean: RIE

In 2016 the Faculty of Engineering and Information Technology (FEIT) have used the foundation of the past few years to produce the best research outputs and activities. This is a testimony for the hard work and effort that was committed within the faculty in 2016. Our vision is to to guide the researchers to have a global impact, post-graduate students to have an outstanding research experience and provide staff with the opportunity for a lifelong engagement with research producing improved research productivity.

The advancement and commitment to research in FEIT was evident in that all VC awards presented was to staff members of the faculty. The CRPM were given ISO xxx certification and thus proof once again its leadership national and international within their field. The research entities are progressing and it is shown in their activities, outputs and participation from industry as well as staff. We had a very good growth in post-graduate student numbers as well as completed studies.

It is now time to focus and ensure that we produce quality post-graduate students, that we take industry with us in our projects and earn very important external funding. Within the renewed focus we will need to assist researchers to become innovators and agents of progress at regional, national and international level, capable of transferring their knowledge to society. The faculty will need to enhance the research capacity within the faculty through strategic planning and development of staff and utilise research entities as vehicles of change within the research landscape of the faculty.

It is now time to focus and ensure that we produce quality post-graduate students, that we take industry with us in our projects and earn very important external funding.



Prof Herman Vermaak
Assistant Dean
Faculty of Engineering and
Information Technology

Research Seminars

Faculty of Engineering and Information Technology hosted its 19th annual research seminar on 26th October at Japie van Lill auditorium with over 170 delegates from CUT, industry, consultants, academia in attendance. The annual event has been in existence for the last nineteen years and has proved to be valuable as a means to showcase industry-related research that is being done in the faculty by staff members and postgraduate students. This year once again we had a key note speaker

and publishing the accepted full papers in CUT Interim journal. Fourteen papers were presented on the seminar day. The keynote speaker, Prof Richard Ray, was from the Department of Structural and Geotechnical Engineering Széchenyi István University in Hungary. Unfortunately, he was unable to be present in person but provide a video with his presentation. At the end of the seminar, prizes were handed in after the presentations being adjudicated by a team of judges.



From left: Prof A Ngowi, Dean FEIT; Dr N Ngubane, Director for emerging researcher programmes at NRF; Mrs T Pillay, Director within the grants and system administration directorate at NRF; Ms Zenobia Louw, CUT Research Officer: NRF Activities, Dr M Mostafa, Research manager at FEIT.

Research Culture Workshop

The Faculty of Engineering and Information Technology hosted the 3rd research culture workshop on 1st Sep 2016. The theme of 2016 was "Grants Grasp and Dr N Ngubane and Mrs T Pillay, two directors at NRF, honoured the workshop with their keynote speeches. Prof A Ngowi, FEIT Dean, presented his ideas on "Quest for FEIT Research Culture". He explained where we came from and showed the strategic direction of the faculty to have research as a base that informs teaching and learning, and community engagement activities. Prof Ngowi clarified that research culture is like an iceberg where we can see only small part. Moreover, he highlighted the lessons learnt from the previous workshops and paved the way for this one to start. Dr N Ngubane explained to the attendees the revised structure of NRF and the activities running within her directorate. Special attention was given to the support available for the emerging researcher's opportunities. Additionally, she explained the NRF application

process with Thuthuka as a popular example. Then, she displayed the common reasons for rejections of applications at NRF followed by giving advices for the applicants and their institutions. Finally, she presented few slides on behalf of the NRF students support unit. Mrs T Pillay took the attendees through the journey of grants management. She started with clarifying the objectives of her directorate and then explained the processes for application, system, and grants management. She raised the concern of grants roll over before highlighting the opportunities for next research generations. The role of the institution research office was also discussed. These presentations were followed by demonstrations for some successful stories and experiences from main faculty researchers like Prof F Emuze, Prof W du Preez, Ms Z Louw, Dr L Theron, Dr K Kusakana and Prof Y Woyessa.



Completed Master's Degrees

- Aucamp, J. 2016. Extending the technology acceptance model in e-learning discussion forum adoption: University of technology students' perspectives. Central University of Technology, Free State.
- Bashingi, N. 2016. Investigating ICT Solutions for the Public Transportation Improvement in the Free State: Challenges and Opportunities. Central University of Technology, Free State.
- Els, J. 2016. Optimal process parameters for Direct Metal Laser Sintering of Ti64 for medical implant production. Central University of Technology, Free State.
- Heyns, M.W. 2016. Fly Ash as an Alternative Stabiliser for Road Pavement Materials. Central University of Technology, Free State.
- Honiball, J. 2016. Engineering Accessibility of Open Recreational Facilities in Urban Residential Areas of Bloemfontein City, South Africa. Central University of Technology, Free State.
- KeetsE, M. 2016. Re-engineering of Traffic Systems in the Central Business District (CBD) of a South African City: The Case of Kimberley City. Central University of Technology, Free State.
- Kehositse, O.W. 2016. Central University of Technology, Free State.
- Kinnear, W.A. 2016. Multi material structures for biomedical applications. Central University of Technology, Free State.
- Mosianedi, T.J. 2016. Pavement Management Analysis using RONE: Case of the Free State Province. Central University of Technology, Free State.
- Mosimanyane, K.D. 2016. Validation of heat transfer simulation models for injection moulding of ABS in Alumide® tooling. Central University of Technology, Free State.
- Nsengimana, J. 2016. An investigation into surface finish improvement of small plastic parts manufactured through Additive Manufacturing. Central University of Technology, Free State.
- Pietersen, J.P.J. 2016. Areal Reduction Factors for Design Rainfall Estimation in the C5 Secondary Drainage Region of South Africa. Central University of Technology, Free State.
- Van Zyl, I. 2016. Residual stress of Ti6Al4V(ELI) parts manufactured by direct metal laser sintering. Central University of Technology, Free State.

Completed Doctorate Degrees

- Gericke, O.J. 2016. Estimation of Catchment Response Time in Medium to Large Catchments in South Africa. Unpublished PhD Eng thesis, School of Engineering, Department of Bioresources Engineering, University of KwaZulu-Natal, Pietermaritzburg, RSA.
- Mabanza, N. 2016. Determining The Usability of Pedagogical Interface Agents in The Context of Adult Computer Literacy Training: A South African Perspective. University of the Free State (UFS).
- Mwagha, S.M. 2016. Weather lore validation tool using fuzzy cognitive maps based on computer vision. Central University of Technology, Free State.

List of national conference papers

- Booyesen, G.J., Van der Merwe, A., De Beer, D.J., Van den Heever, C. and Els, J. 2016. "Developing a patient-specific maxillary implant using Additive Manufacturing and Design". COMA 2016, International Conference on Competitive Manufacturing. 27 – 29 January, Wallenberg Conference Centre, Stellenbosch.
- Du Preez, W., Booyesen, G. and Möller, H. 2016. "Growing Aluminium Demand through 3D Printing", AFSA International Aluminium Conference & Exhibition, 16 – 18 March 2016, Lagoon Beach Hotel, Cape Town.
- Dzogbewu, T.C., Monaheng, L., Els, J., Van Zyl, I., Du Preez, W.B., Yadroitsava, I. and Yadroitsev, I. 2016. "Evaluation of the compressive mechanical properties of cellular DMLS structures for biomedical applications" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016.
- Emuze, F.A. and Khetheng, A. 2016. Workers' safety on construction sites: use of PPEs in Lesotho. In: Proceedings of the 9th CIDB Postgraduate Conference, 1-4 February, Cape Town, South Africa, 220-228. ISBN: 978-0-62069590-9.
- Hertzog, P. E. and Swart, A. J. 2016. "A simulated energy monitoring system to enable undergraduate engineering students to grasp fundamental energy generation principles," in SAUPEC 2016, Vaal University of Technology, 2016.
- Hertzog, P. E. and Swart, A. J. 2016. Student Voices regarding Practical Instruction in a Solar Energy Course indicates Student Satisfaction. SWART, A. J., AEEA 2016, 6th African Engineering Education Association Conference 20-22 September 2016, Bloemfontein, South Africa. ISBN: 978-0-620-72388-6. Central University of Technology.
- Kinnear, A., Dzogbewu, T.C, Yadroitsava, I. and Yadroitsev, I. 2016. "In-situ alloying process of Ti6Al4V-xCu structures by direct metal laser sintering" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016.
- Kouprianoff, D., Du Plessis, A., Yadroitsava, I. and Yadroitsev I. 2016. "Non-destructive testing of the parts manufactured by direct metal laser sintering" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016
- Liphoto, T. and Masinde, M. 2016. Ubiquitous Traffic Management with Fuzzy Controller System- Case Study of Maseru Lesotho. The IST-Africa 2016 Conference Proceedings, held in Durban, South Africa, 11-13 May 2016. Paul Cunningham and Miriam Cunningham (Eds), IIMC International Information Management Corporation, 2016.
- Louw, J., Swart, A. J. and Bere, A. 2016. Extending the Technology Acceptance Model for e-Learning Discussion Forum Adoption. Swart, A. J. 2016. AEEA, 6th African Engineering Education Association Conference 20-22 September 2016, Bloemfontein, South Africa. ISBN: 978-0-620-72388-6. Central University of Technology.
- Mafunda, B., Swart, A. J. and Bere, A. 2016. A review of the Information System Models for Technology Acceptance. Swart, A. J., AEEA 2016, 6th African Engineering Education Association Conference 20-22 September 2016, Bloemfontein, South Africa. ISBN: 978-0-620-72388-6. Central University of Technology.
- Malefane, L.B., Du Preez, W.B. and Maringa, M. 2016. "Fatigue properties of Ti6Al4V (ELI) parts built by Direct Metal Laser Sintering with standardised process parameters followed by post-processing treatments" Pre-conference seminar to 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 1 November 2016.
- Maphats'oe, T. and Masinde, M. 2016. A Security Algorithm for Wireless Sensor Networks in the Internet of Things Paradigm. The IST-Africa 2016 Conference Proceedings, held in Durban, South Africa, 11-13 May 2016. Paul Cunningham and Miriam Cunningham (Eds), IIMC International Information Management Corporation, 2016.
- Masheane, L., Du Preez, W.B. and Combrinck, J. 2016. "Assessment of manufacturability and properties of polyurethane heart valves produced through a locally developed dip moulding process" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016.
- Mbele, M. and Masinde, M. 2016. Development of Adaptive Environmental Management System: A Participatory Approach through Fuzzy Cognitive Maps. The IST-Africa 2016 Conference Proceedings, held in Durban, South Africa, 11-13 May 2016. Paul Cunningham and Miriam Cunningham (Eds), IIMC International Information Management Corporation, 2016.

- Moletsane, M.G., Krakhmalev, P., Kazantseva, N., Du Plessis, A., Yadroitsava, I. and Yadroitsev, I. 2016. "Tensile properties and microstructure of direct metal laser sintered Ti6Al4V (ELI) alloy" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016.
- Mollo, L.G. Emuze, F.A. and Geminiani, F. 2016. Making project team decisions using choosing by advantages on a concrete task project. In: Proceedings of the 5th Construction Management Conference, 28 November to 29 November 2016, Port Elizabeth, South Africa, pp 63-72. ISBN: 978-1-920508-70-8.
- Monaheng, L.F., Du Preez, W.B., Olwagen, A. and Haupt, P. 2016. "Finite element analysis of a Ti6Al4V (ELI) mandibular implant produced through additive manufacturing" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016.
- Monyane, T.G. Emuze, F.A. and Crafford, G. 2016. Conceptual Evaluation Ideas for the Infrastructure Delivery Improvement Programme in South Africa, In: Proceedings of the 5th Construction Management Conference, 28 November to 29 November 2016, Port Elizabeth, South Africa, 91-100. ISBN: 978-1-920508-70-8.
- Muriithi, G.M. and Masinde, M. 2016. Cloud SAMS: Cloud Computing Solution For Public Schools in South Africa's "Second Economy" In: IST-Africa 2016 Conference Proceedings. Durban, South Africa.
- Nsengimana, J. and Van der Walt, J.G. 2016. "State of the art of additive manufacturing for polymeric medical implants" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016.
- Okorie, V.N. Emuze, F.A. and Smallwood, J. 2016. Exploring the impact of team members' behaviour on accident causation within construction projects. In: Proceedings of the 5th Construction Management Conference, 28 November to 29 November 2016, Port Elizabeth, South Africa, 54-63. ISBN: 978-1-920508-70-8.
- Olwagen, A. and Swart, A. J. 2016. Student Voices Regarding Practical Work done in a Mechanical Engineering Laboratory Reveals Satisfaction! SWART, A. J., AEEA 2016, 6th African Engineering Education Association Conference 20-22 September 2016, Bloemfontein, South Africa. ISBN: 978-0-620-72388-6. Central University of Technology.
- Raath, J., Mouton, H.D.T. and Geyer, T. 2016. "Optimization of the geometrical solution space for extended horizon MPC to a NPC multi-level inverter". In SAUPEC 2016, Vaal University of Technology, 2016.
- Sithole, Y. and Kotze, B. 2016. "Protection Over Current Curve plotter with Fault locator application", in SAUPEC 2016, Vaal University of Technology, 2016
- Swart, A. J. and Hertzog, P. E. 2016. "Contrasting three different academic assessments of a compulsory capstone module in power engineering indicates reliability!" in SAUPEC 2016 Southern African Universities Power Engineering Conference, Vaal University of Technology, 2016.
- Swart, A. J. and Hertzog, P. E. 2016. Verifying an economic viable load for experimental purposes relating to small scale PV modules.
- Thejane, K., Du Preez, W.B. and Chikosha, S. 2016. "Initial Characterising Ti6Al4V (ELI) Powder Used for Additive Manufacturing Applications in South Africa" Pre-conference seminar to 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 1 November 2016.
- Van der Merwe, A., Booysen G.J., De Beer, D.J., Van den Heever, C. and Els, J. 2016. "Additive Manufacturing for Cranio Maxillary Facial reconstruction". 2nd Stellenbosch University Biomedical Engineering Conference 2016. 22-24 March, Wallenberg Conference Centre, Stellenbosch.
- Van der Walt, J.G., Van den Heever, J.H., Els, J. and Booysen, G.J. 2016. "A business case study for comparing the manufacturing of implant-supported denture frames through direct metal laser sintering to conventional casting and machining processes" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016.
- Van Loggerenberg, S. and Laureles, J. 2016. Satnac, 4 - 7 September, Fancourt, George, Western Cape. ISBN: 978-0-620-72418-0. SATNAC.
- Van Zyl, I., Moletsane, M.G., Krakhmalev, P., Yadroitsava, I. and Yadroitsev I. 2016. "Validation of miniaturised tensile testing on DMLS Ti6Al4V (ELI) specimens" 17th Rapid Product Development Association of South Africa (RAPDASA) conference, VUT Southern Gauteng Science and Technology Park. 2-4 November 2016.
- Venter, M.I. and De Wet, L. 2016. Perceived enjoyment of mobile mathematical learning games, Proceedings of the ISTE Conference on Mathematics, Science and Technology Education, October 24-28, 2016, Kruger National Park, South Africa, pp. 112 – 119.

- Venter, M.I., De Wet, L. and Swart, J. 2016. Perceptions of parents and teachers of the use of mobile apps for mathematical education, Proceedings of the ISTE Conference on Mathematics, Science and Technology Education, October 24-28, 2016, Kruger National Park, South Africa, pp. 641 – 651.
- Vermaak, E., Janse, J. and Rensburg, V. 2016. Robot Movement Parameterization using Chess as a Case Study within an Education Environment. Pattern Recognition Association of South Africa and the Robotics and Mechatronics International Conference, 30 November to 2 December 2016, Stellenbosch.
- Yadroitsev, I., Van Zyl, I., Moletsane, M.G. and Yadroitsava, I. 2016. "Direct Metal Laser Sintering of Ti6Al4V (ELI) Powder". International Conference on Competitive Manufacturing (COMA'2016), 27-29.01.2016, Stellenbosch, RSA. (ISBN No 978-0-7972-1602-0), p. 127-132.

List of international conference proceedings

- Adedeji, J.A., Abejide, S.O. and Mostafa, M.H. 2016. Effectiveness of Communication Tools in Road Transportation: Nigerian Perspective. Proceedings, International Conference on Traffic and Transport Engineering (ICTTE). Belgrade, Serbia, 24–25 November 2016, pp. 510–517.
- Awuzie, B.O. and Emuze, F.A. 2016. Barriers to the Sustainable Procurement of Built University Assets in Sub-Saharan Africa. Proceedings of the 5th International Conference on Infrastructure Development in Africa, Johannesburg, South Africa, 10-12th July, 2016. 159-169. ISBN: 978-0-86970-795-1.
- Bashingi, N. and Mostafa, M.H. 2016a. Possible impacts of ICT based demand-responsive public transportation schemes in the Free State. Proceedings, 35th Southern African Transport Conference (SATC 2016). 4–7 July 2016, Pretoria, RSA. pp 225–234.
- Bashingi, N. and Mostafa, M.H. 2016b. Perspectives of the stakeholders of the public transportation system on ICT solutions applicability in the Free State, South Africa. Proceedings, The Joint International Conference: 21st Century Human Habitat: Issues, Sustainability and Development. Nigeria, March 2016, pp. 921–929.
- Beste, D.M., Stott, P.R. and Theron, E. 2016. The movement of moisture under a Government Subsidy house. In: SW Jacobsz (Ed.). Proceedings, 2nd Southern Africa Geotechnical Conference, 5–6 May 2016. Sun City, RSA. ISBN: 978-1-138-02971-2.
- Connell, E., van Bakel, A. and Emuze, F.A. 2016. Global sustainability perspectives X3: North America, Europe, and Africa. In proceedings of the CIB World Building Congress 2016, May 30 – June 3, 2016, Tampere, Finland, 152-162, ISBN: 978-952-15-3740-0.
- Das, D.K., Sonar, S.G. and Emuze, F. 2016. Comprehending the Role of People in Urban Redevelopment in Indian Cities. Proceedings, The Joint International Conference: 21st Century Human Habitat: Issues, Sustainability and Development. Nigeria, March 2016, pp. 1677–1687.
- Das, D.K. 2016a. Images of Central Areas, Comparative analysis between South African and European cities, Proceedings, 7th Planning Africa Conference 2016 – Making Sense of the Future: Disruption and Reinvention. 4–6 July, 2016, Sandton Convention Centre, Johannesburg, RSA. ISBN: 978-0-620-69628-9.
- Das, D.K. 2016b. Modelling to Resolve Design Linked Delay in Construction Projects. Proceedings, 5th International Conference on Infrastructure Development in Africa, pp. 97–109. ISBN: 978-0-86970-795-1.
- Das, D.K. 2016c. Socio-Cultural Perspectives for Post Disaster Social Infrastructure Restoration Management in India. Proceedings, 5th International Conference on Infrastructure Development in Africa, pp. 110–121. ISBN: 978-0-86970-795-1.
- Das, D.K. 2016d. Influence of Administrative and Political Authorities' Decisions on the Construction of Community Development Projects in India. Proceedings, 5th Construction Management Conference, Port Elizabeth, RSA, pp. 186–193, ISBN: 978-1-920508-70-8.
- Das, D.K. 2016e. Perceptions of Skilled Labour Attributes on Delay on Construction Projects in India. Proceedings, 5th Construction Management Conference, Port Elizabeth, RSA, pp. 235–240, ISBN: 978-1-920508-70-8.
- Das, D.K. and Honiball, J. 2016a. Evaluation of Accessibility Challenges of Public Parks in Residential Areas of South African Cities - A Case Study of Bloemfontein City, Proceedings, 35th Southern African Transport Conference (SATC 2016), pp. 539–557. ISBN: 978-1-920017-64-4.

- Das, D.K. and Honiball, J. 2016b. Effects of the Pedestrian Pavement Network and Illumination on Accessibility on Public Parks in South African Cities. Proceedings, International Conference on Traffic and Transport Engineering, pp. 687–693, ISBN: 978-86-916153-3-8.
- Das, D.K. and Keetse, M. 2016. Evaluation of Traffic Congestion and Re-Engineering Solutions for Central Areas of South African Cities: A Case Study of Kimberley City. Proceedings, International Conference on Traffic and Transport Engineering, pp. 524–532. ISBN: 978-86-916153-3-8.
- Das, D.K., Tom, S. and Honiball, J. 2016. Futuristic Intelligent Transportation System Architecture for Sustainable Road Transportation in Developing Countries. Proceedings, 35th Southern African Transport Conference (SATC 2016), pp. 207–224. ISBN: 978-1-920017-64-4.
- Du Preez, W. 2016. "AM for Metal Parts": M6-SA-MEDAERO, IMS Workshop on Global Cooperation in Additive Manufacturing, 2 May 2016, Fundació Centre CIM, Barcelona, Spain.
- Du Preez, W., Booysen, G. and Möller, H. 2016. "Growing Aluminium Demand through 3D Printing", AFSA International Aluminium Conference & Exhibition, 16 – 18 March 2016, Lagoon Beach Hotel, Cape Town.
- Emuze, F., Linake, M. and Seboka, L. 2016. Construction Work and the Housekeeping Challenge in Lesotho. In: P W Chan and C J Neilson (Eds.) Proceedings of the 32nd Annual ARCOM Conference, 5-7 September 2016, Manchester, UK, Association of Researchers in Construction Management, 1,537-546. ISBN: 978-0-9955463-0-1.
- Emuze, F.A. and Awuzie, B.O. 2016 Exploring the Implementation of a Sustainability Framework at CUT, Proceedings of the Sustainable Ecological Engineering Design for Society Conference, Leeds-Beckett University, Leeds, 14-15th September, 2016, 249-261. ISBN: 978-0-9955690-1-0.
- Emuze, F.A. and Mathinya, L. 2016. Assessing the feasibility and use of target value design in South African construction. In: Proceedings of the 24th Annual Conference of the International Group for Lean Construction, 20-22 July, Boston, USA, (Volume 1) 73-82. ISBN: 978-0-9977376-2-2.
- Emuze, F.A. and Nkhabe, N. 2016. Slum development challenges in Meqheleng, Free State, South Africa. In: Proceedings of the 2016 International Conference on Infrastructure Development in Africa, 10-12 July, Johannesburg, South Africa, 1-10. ISBN: 978-0-86970-795-1.
- Emuze, F.A., Joseph, K. and Pretorius, E. 2016. Exploring 'lean' opportunities for improving supply chain transaction governance in South African construction projects. In: Proceedings of the 24th Annual Conference of the International Group for Lean Construction, 20-22 July, Boston, USA, 13-22. (Volume 2) ISBN: 978-0-9977376-2-2.
- Emuze, F.A., Matete, R. and Smallwood, J.J. 2016. Construction permit to work requirement in South Africa: closing commencement gaps. In proceedings of the CIB World Building Congress 2016, May 30 – June 3, 2016, Tampere, Finland, 247-258, ISBN: 978-952-15-3740-0.
- Emuze, F.A., van Eeden, L. and Geminiani, F. 2016. Regulatory factors contributing to building collapse in South Africa: A Case Study. In proceedings of the CIB World Building Congress 2016, May 30 – June 3, 2016, Tampere, Finland, 236-246, ISBN: 978-952-15-3740-0.
- Gericke, O.J. and Du Plessis, J.A. 2016. Development of a customised design flood estimation tool to estimate floods in gauged and ungauged catchments. Proceedings, SAIAE Symposium and Biennial CPD Event. Kruger National Park, RSA.
- Gericke, O.J., and Smithers, J.C. 2016. Direct estimation of catchment response time parameters in medium to large catchments using observed streamflow data. Proceedings, SAIAE Symposium and Biennial CPD Event. Kruger National Park, RSA.
- Hertzog, P. and Swart, A.J. 2016. "Arduino – Enabling engineering students to obtain academic success in a design-based module," in EDUCON, Abu Dhabi, 2016.
- Hertzog, P.E. and Swart, A.J. 2016. A Case Study: Validating a LabVIEW simulation model's presentation of fundamental principles in emerging renewable energy systems. EMERGITECH 2016, The 2016 IEEE International Conference on Emerging Technologies and Innovative Business Practices for the Transformation of Societies, 01-06 August, Mauritius. ISBN: 978-1-5090-0706-6.
- Hertzog, P.E. and Swart, A.J. 2016. A Case Study: Validating a LabVIEW simulation model's presentation of fundamental principles in emerging renewable energy systems. EMERGITECH 2016, The 2016 IEEE International Conference on Emerging Technologies and Innovative Business Practices for the Transformation of Societies, 01-06 August, Mauritius. ISBN: 978-1-5090-0706-6.

- Hertzog, P.E. and Swart, A.J. 2016. The impact of atmospheric conditions on the sustainability of a PV system in a semi-arid region: A case study from South Africa. ECTI-CON, 13th International Conference on Electrical Engineering, Electronics, Computer and Information Technology, 28 June to 1 July, Chiang Mai, Thailand.
- Hertzog, P.E. and Swart, A.J. 2016. Validating the optimum tilt angle for PV modules in the central region of South Africa for the winter season, ECTI-CON, 13th International Conference on Electrical Engineering, Electronics, Computer and Information Technology, 28 June to 1 July, Chiang Mai, Thailand.
- Heyns, M.W. and Mostafa, M.H. 2016. Durability of classified G5 materials stabilized with South African fly ash. Proceedings, 8th AUS-IMS International Conference on Materials Science and Engineering, IMS/8. February 2016, Sharjah, United Arab Emirates, pp.28–31.
- Heyns, M.W., Adedeji, A.J. and Mostafa, M.H. 2016. Utilization of Fly Ash in Road Construction in South Africa: Environmental Assessment. Proceedings, The Joint International Conference: 21st Century Human Habitat: Issues, Sustainability and Development. Nigeria, March 2016, pp. 426–432.
- Isa, R.B. and Emuze, F.A. 2016. Lean sustainable indices: a case for South African public infrastructure sector. In proceedings of the CIB World Building Congress 2016, May 30 – June 3, 2016, Tampere, Finland, 545-557, ISBN: 978-952-15-3740-0.
- Isa, R.B., Emuze, F. and Das, D.K. 2016. Conceptual Transformation Process Model for Sustainability in the Infrastructure Sector. Proceedings, 5th International Conference on Infrastructure Development in Africa, pp. 16–24. ISBN: 978-0-86970-795-1.
- Isa, R.B., Emuze, F.A. and Das, D.K. 2016. Conceptual transformation process model for sustainability in the infrastructure sector. In: Proceedings of the 2016 International Conference on Infrastructure Development in Africa, 10-12 July, Johannesburg, South Africa, 16-24. ISBN: 978-0-86970-795-1.
- Krakhmalev, P., Fredriksson, G., Yadroitsava, I., Kazantseva, N., Du Plessis, A. and Yadroitsev I. 2016. "Deformation behavior and microstructure of Ti6Al4V manufactured by SLM". 9th International Conference on Photonic Technologies – LANE 2016 (abstract was approved, paper submitted)
- Kuriakose, R.B. and Luwes, N.J. 2016. Student perceptions to the use of paperless technology in Assessments- a case study using clickers HEAD'16 June 21 – 23, 2016 · Valencia (Spain).
- Kuriakose, R.B., Luwes, N.J. and Vermaak, H.J. 2016. Designing a temperature control system for a craft beer fermenter using Arduino and Simulink-a budding entrepreneurs perspective. ICMFE-2016 19-20 November, Durban (South Africa).
- Kusakana, K. 2016. "A Review of Energy in the Democratic Republic of Congo". International Conference on Desalination and Renewable Energy (ICDRE 2016), Copenhagen Denmark.
- Kusakana, K. 2016. "Energy Dispatching of an isolated Diesel-Battery Hybrid Power System" International Conference on Industrial Technology (ICIT 2016), Taipei, Taiwan.
- Kusakana, K. 2016. "Optimal operation control of a grid-connected photovoltaic-battery hybrid system". IEEE PowerAfrica 2016, Livingstone, Zambia.
- Kusakana, K. 2016. "Overview of Different Approaches Used in Optimal Operation Control of Hybrid Renewable Energy Systems". International Conference on Desalination and Renewable Energy (ICDRE 2016), Copenhagen Denmark.
- Kusakana, K. 2016. Optimal scheduling of a grid-connected hydrokinetic-battery system under Time of Use tariff ". International conference on Domestic Use of Energy (DUE 2016), Cape town, South Africa,
- Louw, Z. and Mostafa, M.H. 2016. Barriers behind limited participation of Central University of Technology academic staff in NRF funding programmes. Poster, SARIMA Conference, May 2016, Durban, RSA.



- Luwes, N., Meda, L. and Swart, J. 2016. Advances Academic and Student Perceptions on the Integration of HIV and AIDS education in an Electrical Engineering Curriculum at a South African University of Technology (HEAd'16) June 21 – 23, 2016 · Valencia (Spain).
- Mafunda, B., Bere, A. and Swart, J. 2016. July. Establishing Determinants of Electronic Books Utilisation: An Integration of Two Human Computer Interaction Adoption Frameworks. In International Conference on Human-Computer Interaction (pp. 549-562). Springer International Publishing.
- Makanda, G. and Sibanda, P. 2016. Numerical analysis of free convection Casson fluid flow from a spinning cone in non-Darcy porous medium with partial slip and viscous dissipation effects, International Journal of Mathematical and Computational Methods, Vol.1, 221-230, <http://www.ias.org/ias/journals/ijmcm>.
- Maringa, M. 2016. A Semi-Empirical Method for Determining the Averaged Orientation of Reinforcing Fibre in Fibre Reinforced Composites. 2016 International Conference on Sustainable Research and Innovation Conference. 4 – 6 May Kenya School of Monetary Studies, Nairobi, Kenya (author did not attend conference but paper was taken up in proceedings).
- Maringa, M. 2016. Predicting the Elastic Moduli of Particulate Composites with Isotropic, Homogeneous and Single Moduli Constituents for the Case of Perfectly Plastic Matrices. 2016 International Conference on Sustainable Research and Innovation Conference. 4 – 6 May, 2016 Kenya School of Monetary Studies, Nairobi, Kenya (author did not attend conference but paper was taken up in proceedings).
- Markus, E.D. 2016. Experimental Validation on Flatness based Control of Flexible Robot Arm IEEE Robotics and Mechatronics (PRASA-ROBMECH) Conference, November 2016. Stellenbosch, South Africa.
- Mollo, L.G., Emuze, F.A. and Geminiani, F. 2016. Choosing by advantages in project team decisions: case studies of concrete works in South Africa. In: Proceedings of the 2016 International Conference on Infrastructure Development in Africa, 10-12 July, Johannesburg, South Africa, 337-346. ISBN: 978-0-86970-795-1.
- Monye, P.K., Stott, P.R. and Theron, E. 2016. Assessment of reliability of the hydrometer by examination of sediment. In: SW Jacobsz (Ed.). Proceedings, 2nd Southern Africa Geotechnical Conference, 5–6 May 2016. Sun City, RSA. ISBN: 978-1-138-02971-2.
- Mostafa, M.H. and Adediji, A.J. 2016. Comparative study of material input methods for numerical simulation of fly ash flexible pavement. Proceedings, 8th AUS-IMS International Conference on Materials Science and Engineering, IMS/8. February 2016, Sharjah, United Arab Emirates, pp. 32–35.
- Mostafa, M.H. and Adediji, A.J. 2016. Numerical Simulation of Pavement Life Deterioration: Tree-Roots' Effects. Proceedings, 5th International Conference on Civil Engineering and Urban Planning (CEUP 2016), China. [In Print].
- Motuba, L., Nogqala, N., Monyane, T.G., and Emuze, F.A. 2016. Target Costing in Construction: Perceptions from Quantity Surveyors In: Proceedings of the 2016 International Conference on Infrastructure Development in Africa, 10-12 July, Johannesburg, South Africa, 327-336. ISBN: 978-0-86970-795-1.
- Okorafor, C., Emuze, F. and Das, D.K. 2016a. Relative Importance of Health & Safety Performance Evaluation Factors in Organisation Level within Gauteng Construction Industry. Proceedings, 5th International Conference on Infrastructure Development in Africa, pp. 397–406. ISBN: 978-0-86970-795-1.
- Okorafor, C., Emuze, F. and Das, D.K. 2016b. Managing Construction Labour Productivity Improvement in Gauteng. Proceedings, 5th International Conference on Infrastructure Development in Africa, pp. 407–414. ISBN: 978-0-86970-795-1.
- Okorafor, C., Emuze, F.A. and Das, D.K. 2016. Managing construction labour productivity improvement in Gauteng. In: Proceedings of the 2016 International Conference on Infrastructure Development in Africa, 10-12 July, Johannesburg, South Africa, 407-414. ISBN: 978-0-86970-795-1.
- Okorafor, C., Emuze, F.A. and Das, D.K. 2016. Relative importance of health and safety performance evaluation factors in organisational level within Gauteng construction industry. In: Proceedings of the 2016 International Conference on Infrastructure Development in Africa, 10-12 July, Johannesburg, South Africa, 397-406. ISBN: 978-0-86970-795-1.
- Olatunji, A.A. and Das, D.K. 2016. Regenerative Mechanisms to Resolve Contractor Commitment Challenges in Project Delivery. Proceedings, 5th International Conference on Infrastructure Development in Africa, pp. 122–134. ISBN: 978-0-86970-795-1.

- Pietersen, J.P.J., Gericke, O.J. and Woyessa, Y.E. 2016. Areal reduction factors for design rainfall estimation in the C5 secondary drainage region of South Africa. Proceedings, SAIAE Symposium and Biennial CPD Event. Kruger National Park, RSA.
- Raath, J. Mouton, H.D.T. and Geyer, T. 2016. "Integration of Inverter Constraints in Geometrical Quantification of the Optimal Solution to an MPC Controller". 17th IEEE Workshop on Control and Modelling for Power Electronics (COMPEL 2016), Trondheim Norway, 2016.
- Smallwood, J. and Emuze, F. 2016. Towards zero fatalities, injuries and disease in construction. *Procedia Engineering* 164 (2016) – Creative Construction Conference, 453-460.
- Smallwood, J.J. and Emuze, F. 2016. Factors that Promote Zero Fatalities, Injuries and Disease in Construction. In: P W Chan and C J Neilson (Eds.) Proceedings of the 32nd Annual ARCOM Conference, 5-7 September 2016, Manchester, UK, Association of Researchers in Construction Management, 1, 587-596. ISBN: 978-0-9955463-0-1.
- Stott, P.R. and Theron, E. 2016. Variability in soil properties and its consequences for design. In: SW Jacobsz (Ed.). Proceedings, 2nd Southern Africa Geotechnical Conference, 5–6 May 2016. Sun City, RSA. ISBN: 978-1-138-02971-2.
- Swart, A.J. 2016. Correlating the switch-on time of two identical PV modules using a simplified measuring approach, ECTI-CON, 13th International Conference on Electrical Engineering, Electronics, Computer and Information Technology, 28 June to 1 July, Chiang Mai, Thailand.
- Swart, A.J. 2016. The effective use of a learning management system still promotes student engagement! EDUCON 2016, IEEE Global Engineering Education Conference, 10-14 April 2016, Abu Dhabi, UAE, Dusit Thani Hotel.
- Swart, A.J. and Hertzog, P.E. 2016. Validating the acceptance zone for PV modules using a simplified measuring approach, ECTI-CON, 13th International Conference on Electrical Engineering, Electronics, Computer and Information Technology, 28 June to 1 July, Chiang Mai, Thailand.
- Swart, A.J. and Hertzog, P.E. 2016. Validating the acceptance zone for PV modules using a simplified measuring approach, ECTI-CON, 13th International Conference on Electrical Engineering, Electronics, Computer and Information Technology, 28 June to 1 July, Chiang Mai, Thailand.
- Venter, M.I. and De Wet, L. 2016. Continuance Use Intention of Primary School Learners Towards Mobile Mathematical Applications, Proceedings of the 2016 International Conference on Engineering Education, October 12-15, 2016, Earie, United States, pp. 1034-1043.
- Yadroitsev, I. 2016. "A systematic approach to manufacturing parts with desired properties by Selective Laser Melting" Third International Technology Forum 4 – 6 April 2016, Rybinsk, Russia.
- Yadroitsev, I. 2016. "A systematic approach to manufacturing parts with desired properties by Selective Laser Melting". Third International Technology Forum "Innovation. Technology. Manufacturing", 4 – 6 April 2016, Rybinsk, Russia.

List of Journals/Articles (DHET subsidised)

- Abuzeinab, A., Arif, M., Kulonda, D. and Awuzie, B.O. 2016. Green Business Models Transformation: Evidence from the UK Construction Sector Built Environment Project and Asset Management Journal, 6(5): 478-490
- Awuzie, B. and Emuze, F. 2016. Barriers to the sustainable procurement of built university assets in sub-Saharan Africa, *Journal of Construction Project Management and Innovation*, 6(Supplement 1), ISSN: 2223-7852.
- Awuzie, B.O. and McDermott, P. 2016. Assessing Temporary Multi-Organisational Viability- Oil and Gas Project Based Organisation Case Study. *Built Environment Project and Asset Management Journal*, 6(3): 268-283.
- Awuzie, B.O. and McDermott, P. 2016. The Role of Contract Strategies in Social Value Implementation Proceedings of Institution of Civil Engineers (ICE)-Management, Procurement and Law, 169(3): 106-114.
- Das, D.K. 2016b. Engendering image of creative cities by use of information and communication technology in developing countries. *Urban Planning*, 1(3): 1-12, DOI:10.17645/up.v1i3.686.
- Das, D.K. and Burger, E. 2016a. Appraisal of urban road safety factors in South Africa *Municipal Engineer*. DOI: 10.1680/jmuen.15.00022.
- Du Plessis, A., Le Roux, S.G., Booysen, G. and Els, J. 2016. "Directionality of Cavities and Porosity Formation in Powder-Bed Laser Additive Manufacturing of Metal Components Investigated Using X-Ray Tomography". *3D Printing and Additive Manufacturing Journal*, 3(1):48-55, March 22, 2016. doi:10.1089/3dp.2015.0034. ISSN: 2329-7662 • Online ISSN: 2329-7670.

- Emuze, F.A., van Eeden, L. and Geminiani, F. 2016. A South African Case Study on the Causes of Building Collapse, *Journal of Construction Project Management and Innovation*, 5(1), ISSN: 2223-7852.
- Fernandes, N., Van den Heever, J., Hoek, K. and Booysen G. 2016. Customized reconstruction of an extensive mandibular defect: A clinical report. *Journal of Prosthodontics*.
- Fernandes, N., Van den Heever, J., Hoogendijk, C., Botha, S., Booysen, G. and Els J. 2106. "Reconstruction of an Extensive Midfacial Defect Using Additive Manufacturing Techniques". *Journal of Prosthodontics* 00 (2016) 1–6 2016 by the American College of Prosthodontists.
- Gericke, O.J and Smithers, J.C. 2016c. Direct estimation of catchment response time parameters in medium to large catchments using observed streamflow data. *Hydrological Processes* DOI:10.1002/hyp.11102.
- Gericke, O.J. and Smithers, J.C. 2016a. Are estimates of catchment response time inconsistent as used in current flood hydrology practice in South Africa? *Journal of the South African Institution of Civil Engineering* 58(1): 2–15. DOI: 10.17159/2309-8775/2016/v58n1a1.
- Gericke, O.J. and Smithers, J.C. 2016b. Derivation and verification of empirical catchment response time equations for medium to large catchments in South Africa. *Hydrological Processes* DOI: 10.1002/hyp.10922.
- Isa, R.B., Emuze, F. and Das, D.K. 2016. Conceptual transformation process model for sustainability in the infrastructure sector, *Journal of Construction Project Management and Innovation*, 6(Supplement 1), ISSN: 2223-7852.
- Krakhmalev, P., Yadroitsava I., Fredriksson, G. and Yadroitsev, I. "Microstructural and thermal stability of selective laser melted 316L stainless steel single tracks". *The South African Journal of Industrial Engineering* (under review).
- Kubanza, N.S., Das, D.K. and Simatele, D. 2016. Some happy, others sad: exploring environmental justice in solid waste management in Kinshasa, The Democratic Republic of Congo. *Local Environment* DOI: 10.1080/13549839.2016.1242120.
- Kuriakose, R.B. and Luwes, N.J. 2016. "Student perceptions to the use of paperless technology in Assessments- a case study using clickers". *Procedia-Social and Behavioural Sciences* (2016) 228, 77-85.
- Kusakana, K. 2016. "Optimal scheduling for distributed hybrid system with pumped hydro storage" *Energy Conversion and Management* (2016) 111, 253-260.
- Manditereza, P.T. and Bansal, .R.C. 2016. "Multi-agent based distributed voltage control algorithm for smart grid applications", *Electric Power Components and Systems* (2016), 44(20): 2352-2363.
- Manditereza, P.T. and Bansal, R.C. 2016. "Renewable distributed generation: The hidden challenges – A review from the protection perspective", *Renewable and Sustainable Energy Reviews* (2016) 58, 1457-1465.
- Mangara, B.T. and Rambe, P. 2016. "Influence of Integrated Reporting Ratings, CEO age, and years of experience on the share price of top 106 JSE listed companies", *Problems and Perspectives in Management*, 14 (3), pp.-still pending.
- Markus, E.D., Agee, J.T. and Jimoh, A.A. "Flat Control of Industrial Robotic Manipulators" *Robotics and Autonomous Systems* 87(2017): 226–236
- Markus, E.D., Yskander, H., Agee, J. and Jimoh, A.A. 2016. "Coordination control of robot manipulators using flat outputs" *Robotics and Autonomous Systems*, Elsevier (2016) <http://dx.doi.org/10.1016/j.robot.2016.05.006>.
- Matete, K.R., Emuze, F. and Smallwood, J. 2016. Exploring perceived implementation issues of the permit-to-work requirement of the construction regulations in South Africa, *Journal of Construction*, 9(2). ISSN 1994 – 7402.
- Mutanga, S.S., De Vries, M., Mbohwa, C., Das, D.K. and Rogner, H. 2016. An integrated approach for modelling the electricity value of a sugarcane production system. *Applied Energy*, 177: 823–838.
- Nketekete, M., Emuze, A. and Smallwood, J. 2016. Risk management in public sector projects: Case studies in Lesotho, *Acta Structilia*, 23(2): 1-24. ISSN: 1023-0564.
- Nsengimana, J., Van der Walt, J.G. and Pei, J. "Effect of Post-processing on the Dimensional Accuracy of Small Plastic Additive Manufactured Parts". *Rapid Prototyping Journal* (under review).
- Stott, P.R. and Theron, E. 2016. Shortcomings in the estimation of clay fraction by the hydrometer. *Journal of the South African Institution of Civil Engineering* 58(1):14–24.
- Swart, A. J. and Hertzog, P. E. 2016. Varying percentages of full uniform shading of a PV module in a controlled environment yields linear power reduction. *Journal of Energy in Southern Africa*, 27(3): 28-38. ISSN 1021-447X.

Swart, A.J. 2016. Distance Learning Engineering Students Languish Under Project-Based Learning, But Thrive in Case Studies and Practical Workshops. *IEEE Transactions on Education*, 59(2): 98-104. ISSN 0018-9359.

Van As, B., De Beer, D.J., Combrinck, J., Booysen, G.J. and La Grange, J. 2016. "Direct metal laser sintering, utilising conformal cooling, for high volume production tooling". *South African Journal of Industrial Engineering*. (accepted for publication).

Van Zyl, I., Yadroitsava, I., Yadroitsev, I. "Residual stress in Ti6Al4V objects produced by direct metal laser sintering". *The South African Journal of Industrial Engineering* (under review).

Vermaak, H., Nsengiyumva, P. and Luwes, N. 2016. Using the Dual-Tree Complex Wavelet Transform for Improved Fabric Defect Detection. Article in journal: *Journal of Sensors*, 2016, 1-8. ISSN: 1687-7268.

List of Books

Dubarle, P. and Woyessa, Y.E. 2016. *Regional Innovation: Government Policies and the Role of Higher Education Institutions*. Sun Press. ISBN: 978-1-920382-80-3.

Maringa, M. 2016. *The Elastic Behaviour of Dual Moduli Materials in Bending Create Space*. Create Space Independent Publishing Platform. ISBN: 978-1522852544

List of Chapters

Emuze, F.A. and Saurin, T.A. 2016. Wastes in construction: concepts and types. In: Emuze, F.A. and Saurin, T.A. (eds.) *Value and Waste in Lean Construction*, Oxon, UK: Routledge (Taylor and Francis). pp. 7-14. ISBN: 978-1-138-90370-8 (hbk) & ISBN: 978-1-315-69671-3 (ebk).

Emuze, F.A., Opoku, A. and Smallwood, J.J. 2016. Lean and sustainability in construction: creating value. In: Emuze, F.A. and Saurin, T.A. (eds.) *Value and Waste in Lean Construction*, Oxon, UK: Routledge (Taylor and Francis). pp. 72-86. ISBN: 978-1-138-90370-8 (hbk) & ISBN: 978-1-315-69671-3 (ebk)

Emuze, F.A. 2016. Using case-based methods in construction research with complementarities. In: Ahmed, V, Opoku, A. and Aziz, Z. (eds.) (2016), *Research Methodology in the Built Environment: A Selection of Case Studies*, Routledge: London, ISBN: 978-1-138-77842-9 (hbk) & ISBN: 978-1-315-73552-8 (ebk). Available from: <http://www.tandf.net/books/details/9781138849471/>

Das, D.K. 2016. System Analysis and System Dynamics Modelling for Social and Ecological Sustainability Challenges. In: Subrata Pan, Somnath Mukherjee, Dhruven Chakroborty, Swarup Ganguly (Eds). *Environment, People and Management: A Developmental Perspective*. Renu Publishers, New Delhi, pp. 1-20. ISBN: 978-93-85502-15-6.





Research Professor: Prof Willie du Preez

Prof Willie du Preez was appointed as associate professor in the Faculty of Engineering and Information Technology from January 2015 and is also serving as Director of the CRPM Research Centre, which was formally established in June 2015. He obtained a PhD in Solid State Physics from the University of Stellenbosch in 1980. His professional career started as a researcher in Materials Engineering at the Uranium Enrichment Corporation of South Africa in 1980. Subsequently, from 1988, he joined High Technology Products (Pty) Ltd, where he led the design and development of satellite pressure vessels and hip replacement implants in Ti6Al4V. He joined CSIR in 1993 and has led the development of products for applications in the medical, automotive and aerospace

industries, as manager of the National Product Development Centre and, subsequently, the Light Metals competence area of the CSIR's Materials Science and Manufacturing unit. From 2012 to March 2014 he served as the Director of the national Titanium Centre of Competence.

He is a co-developer of the South African Additive Manufacturing Strategy (see www.rapdasa.org), which was launched during a RAPDASA Open Day hosted by CUT on its campus on 25 August 2016. Prof du Preez also played a prominent role in the initiation and establishment of the national Collaborative Programme in Additive Manufacturing (CPAM), as first implementation initiative aligned with the strategy. Prof Du Preez serves



on the Steering Committee of this Department of Science and Technology (DST) funded national programme and is the national leader of the CPAM sub-programme on Qualification of Additive Manufacturing of Ti6Al4V for Medical Implants and Aerospace Components. In November 2016 the CPAM was reviewed by an international panel appointed by the DST. The very positive outcome of this review is best described in the executive summary of their report to DST: "The panel agreed that this was one of the best programmes supported by Government, and it should be continued to be supported, as it has already impacted South Africa, and will continue to increase its impact in the future."

In 2016 Prof Du Preez supervised seven master's students in Mechanical Engineering on projects that form part of the CPAM. He is also co-supervisor of one doctorate and one master's student at Vaal University of Technology. These students authored five peer-reviewed papers with Prof Du Preez as co-author at the 2016 RAPDASA Annual International Conference and Pre-Conference Seminar on Additive Manufacturing of Titanium Parts. Another one of his students, Mr I Adam, presented a peer-reviewed paper at the 19th Annual Research Seminar of the Faculty of Engineering and Information Technology of CUT, which was subsequently published in the CUT journal Interim. Apart from these papers Prof Du Preez made presentations as invited speaker at The Research Process Workshop of CUT, the CUT-RAPDASA Open Day

on Additive Manufacturing, the FEIT 3rd Research Culture Workshop of CUT and the 17th RAPDASA Annual International Conference. He also presented at the AFSA International Aluminium Conference & Exhibition and the 9th Annual International SATN Conference.

On 2 May 2016 Prof Du Preez participated in the IMS Workshop on Global Cooperation in Additive Manufacturing held at the Fundació Centre CIM, Barcelona, Spain. A number of international research collaboration clusters were established in this workshop. Prof Du Preez is representing CUT in the Titanium Aero Structures AM (TAS-AM) and the High Productivity Metal AM clusters. Researchers from the EU, UK, USA and Mexico are participating in the cluster activities. During 2016 Boeing Research and Technology of the USA committed to funding two master's projects on additive manufacturing, one at CUT and one at the University of Stellenbosch. The Boeing funded CUT project of Ms Asavela Zenani, titled Metal additive manufacturing of Ti6Al4V from blended elemental powder, is supervised by Prof Du Preez.

A successful application by Prof Du Preez for funding from the National Equipment Fund of the NRF resulted in the purchase in 2016 of a High Temperature High Vacuum Furnace System for heat treatment of Ti6Al4V components produced through additive manufacturing. This system will be delivered and commissioned at CUT in 2017.





Reports from Research Professors - SARCHi Chair: Prof I Yadroittsau

Prof Ihar Yadroitsau (Igor Yadroitsev) was appointed Research Professor at the Central University of Technology, Free State (CUT) on 1 January 2014. In August 2015, CUT was awarded a Research Chair in Medical Product Development grant with Prof Yadroitsau as the grant holder.

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 system, material science). Prof Yadroitsau has a strong interdisciplinary background and broad experience in the fields of Physics and Engineering which allows him to comprehend thoroughly scientific and technical problems with the purpose of finding original solutions in different fields of laser applications. It should be specially mentioned that Prof Yadroitsau has more than 120 scientific publications. His H-index of citation

is 17 in Scopus and 21 in Google scholar. Prof Yadroitsau is an NRF rated researcher (C1).

Under Research the Chair initiative, a metallographic laboratory for the study of material properties has been created in 2015 and was moved to a new building in 2016. In addition to already purchased equipment from 2014-2015, the following equipment was added: Cyto-press (for the preparation of metallographic specimens), Tegramin 25 (automatic polishing machine), Fume hood (to extract hazardous fumes during preparation of samples with etching chemicals for metal microstructure analysis), hardness tester, optical microscope ZEISS Axio Scope.A1 with a high resolution camera, tensile tester MTS CRITERION C43.304 and Artec Space Spider handheld 3D scanner for medical product development through additive manufacturing. Licenses for Mimics and Comsol software was purchased. Mimics is software specially

developed by Materialise for medical image processing, Comsol is a software platform for simulating physics-based problems, such as laser melting of materials or studying of stresses as used in DMLS processing.

Prof Yadroitsau has supervised four masters and one doctoral student in Engineering. Their studies were devoted to selective laser melting, residual stresses, heat treatment and mechanical properties of additive manufacturing objects. In 2016, two of his master's students have successfully completed their education and were awarded with degrees. Mr van Zyl Ian and Mr Kinnear William Allan graduated with M Eng degrees at the September 2016 ceremony at CUT. Students actively participated in international conferences such as 17th International conference RAPDASA (2-4 November 2016, VUT Southern Gauteng Science and Technology Park, South Africa) and International Conference on Competitive Manufacturing (COMA'2016), 27-29 January 2016, Stellenbosch, South Africa.

In 2015 a patent entitled "Additive manufacturing system and method" as produced by Prof Yadroitsau was approved. The invention relates to an innovative method and device for in-process monitoring, measurement and control of the geometric characteristics of 3D objects produced by selective laser melting (SLM). The proposed system will create real-time reports and a "certificate 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 grown products. Furthermore, by using software for analysing the behaviour of the part at different loads, a determination can be made as to the loads that can be used, and the life expectancy of the part can be predicted. Thus, the present invention will not only allow a certificate of part quality after manufacture (pointing to potential problem areas within a manufactured product) to be obtained,

but it will also allow potential weak spots to be corrected dynamically during SLM manufacturing. Reliability and high quality of SLM parts is a vital task for this innovative technology.

Currently a new patent, "Multi-material delivering system for selective laser melting" is in the process of application. This patent describes the multi-material layered device for manufacturing objects consisting of more than one material in a one-step SLM process. Multi-material objects have great potential in the fast-growing AM market, which requires complex objects with prescribed properties. For medical usage, special advanced implants combining different material properties allow the implants to be more bio-compatible and their lifespan to be increased. The rising costs of healthcare may be attributed to an increasing number of medical procedures with great complexity and costly instrumentation. Advanced innovative materials and devices must be developed to reduce the time, economic cost, and physical pain associated with implants, hence the urgent need for this life-saving research work.

In 2016 Prof Yadroitsau, in cooperation with other researchers from RSA, Brazil, Sweden, France and Russia, published nine articles indexed in Scopus and six conference proceedings. Prof Yadroitsau participated in a number of scientific seminars at the CSIR, Stellenbosch University, University of Cape Town, Vaal University of Technology, and Nelson Mandela Metropolitan University. These seminars were devoted to closer cooperation, the scientific challenges and the establishment of a national consortium for producing parts from titanium alloys by additive manufacturing (AM). He is the principal researcher in a three-year programme entitled "Qualification of Additive Manufacturing of Ti6Al4V for Medical Implants and Aerospace Components" which has been granted by the DST.





Report from Post-Doctoral Fellow: Dr Ina Yadroitsava

Dr. Ina Yadroitsava is an established researcher with over 20 years of academic experience in physics, mathematics, statistics and life sciences. Her research interests include physical aspects of laser-matter interaction, numerical simulation, investigation of microstructure and stresses in samples manufactured by additive manufacturing, design of experiments, quality and process-control.

Dr. Yadroitsava was a Postdoctoral Fellow in the Department of Mechanical and Mechatronics Engineering from 2014 to 2016 under the supervision of Dr. Kobus van der Walt. Her research was supported by the South African Research Chairs Initiative under the National Research Foundation of the Department of Science and Technology and the Collaborative Program in Additive Manufacturing.

Since 2014 her research resulted in the publication of 12 articles in the South African Journal of Industrial

Engineering, Materials & Design, Additive Manufacturing Journal, Journal of Alloys and Compounds and others. Under her co-supervision, more than 16 papers were published in conference proceedings at international conferences in cooperation with masters and doctoral students. Her students participated at international conferences including RAPDASA, "Light Metals" and "International Conference on Competitive Manufacturing" held in South Africa between 2014 and 2016. Three students – Alan Kinnear, Ian van Zyl and Morakane Moletsane graduated with masters degrees between 2016 and 2017 under her supervision.

To involve postgraduate students in Material Science studies and to be at the forefront of research in the field of additive manufacturing, a Material Testing laboratory was established at the Department of Mechanical and Mechatronics Engineering. Under the supervision of Research Chair Prof.



I. Yadroitsau and Dr. Yadroitsava the lab was equipped for metallography, optical monitoring, microscopy and microanalysis work. The lab creates the opportunity for students to study the microstructure of different additive manufactured structures, porosity, microhardness, deformation behaviour and its mechanisms in Direct Metal Laser Sintering (DMLS) components.

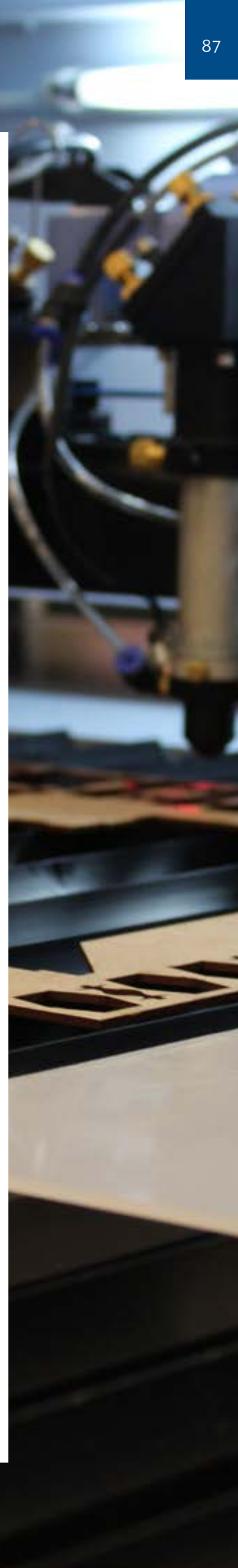
Dr Yadroitsava developed models for temperature fields during laser processing and residual stress simulations for the DMLS process. Residual stress is one of the main drawback of the metal additive manufacturing process. The distributions of residual stresses in DMLS objects to determine optimal process-parameters and building strategy of DMLS parts for biomedicine is one of her focus areas of research. This research is performed in cooperation with Prof. Dannie Hatting at Nelson Mandela Metropolitan University where a modern XRD diffractometer is installed. Another focus area for her is in-situ alloying of medical implants with antibacterial properties. Previous fruitful work performed in cooperation with Dr. Olga de Smidt from the Life Sciences department at CUT, Dr. Arina Kabanova from Vitebsk State Medical University (Belarus) and masters student Allan Kinnear (CUT) showed promised results for Ti6Al4V-1%Cu material where copper is employed as antibacterial agent. She furthermore works with a doctoral student Thywill Dzogbewu (CUT) and

Prof. Pavel Krakhmalev from Karlstad University (Sweden) to determine optimal process-parameters for in-situ DMLS manufacturing of Titanium-Molybdenum beta-alloy. Her work on the production of implants by additive manufacturing from new materials with mechanical properties similar to human bones is very promising. In cooperation with Dr. Anton du Plessis from Stellenbosch University, Dr. Yadroitsava continues working on numerical simulations of mechanical properties of DMLS cellular structures based on CT scan reconstruction.

Studies in destructive and non-destructive testing of additive manufactured parts and their mechanical properties to provide high quality and compliance with international standards is one of the key problem that is Dr. Ina Yadroitsava investigated. Results of this work was presented at highly-rated international conferences such as "Materials Science & Technology" (Columbus, USA, 2015), International Solid Freeform Fabrication Symposium (Austin, USA, 2015), "Powder Metallurgy & Particulate Materials" (San Diego, USA, 2015), "Intermetallics" (Kloster Banz, Germany, 2015) and "Progress in Additive Manufacturing" (Singapore, 2014). Dr. Yadroitsava plans to be involved in the study of processes and materials for Medical Product Development through Additive Manufacturing and she is eager to cooperate with other researches in this field.

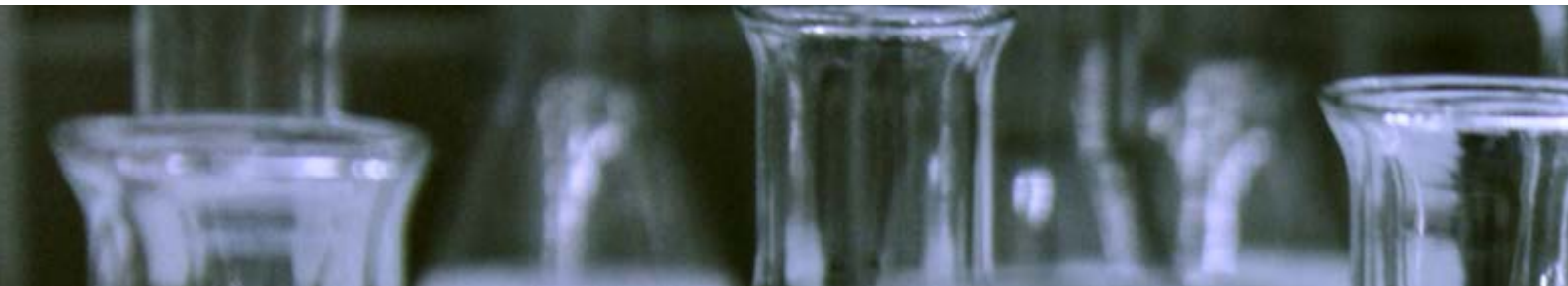
Visiting Professors

- Prof DJ de Beer -
Honorary professor
- Dr HJ van den Heever -
Visiting professor
- Prof S Ramakrishna -
Visiting professor
- Prof Ulrich Klauck -
Visiting professor (Aalen University
of Applied Sciences in Germany)



Fostering Strategic partnerships

Collaborative Parties	Description
Project: National Flood Studies Programme (NFSP)	
Central University of Technology, Free State (OJ Gericke, JPJ Pietersen and CE Allnutt) University of KwaZulu-Natal University of Stellenbosch University of Pretoria University of Bath, UK Department of Water and Sanitation Agricultural Research Council, Institute of Soil, Climate and Water South African Weather Services WRC (Water Research Commission) SANRAL (SA National Roads Agency) SANCOLD (SA Committee on Large Dams) FUNDING: NRF, WRC, SANRAL, SANCOLD and Newton Fund/ Royal Academy for Engineers, UK.	<p>Estimates of design floods are required for the design of hydraulic structures (e.g. dam spillways, waterways, culverts) and to quantify the risk of failure of the structures. Most of the methods currently used for design flood estimation in South Africa were developed in the late 1960s and early 1970s and are in need of updating with more than 40 years of additional data currently available and with new approaches used internationally. The South African National Committee on Large Dams (SANCOLD) has identified the urgent need to update the data and methods used for design flood estimation in South Africa and has initiated a National Flood Studies Programme (NFSP) to update these. Working Groups (WGs) focussing on Rainfall, Flood Analysis Methods, Data and Products have been established to identify and prioritise research needs.</p> <p>A wide range of issues have been highlighted for research by the WGs and these research topics have been synthesised and synchronised into 19 research projects to be undertaken over an eight-year period, anticipated to be from 2017 to 2024. The initial focus is on the compilation and quality control of rainfall, stream flow and catchment data and information databases which will be required by many of the projects. In addition, where existing research initiatives are already underway, these are phased in the earlier parts of the project plan. It is also envisaged that a web portal should be created to serve available data and methods to practitioners and researchers and to update the portal with new data and methods as these become available and hence this ongoing activity is also scheduled at the start of the implementation plan. As summarised in Appendix A, the projected overall budget for the implementation of the NFSP is expected to be of the order of R 35 million in 2017 terms (i.e. excluding escalation in costs).</p> <p>It is envisaged that the NFSP could deliver coordinated and consistent research output, similar to the Hydrological Research Unit at the University of Witwatersrand output in the 1970's under the leadership of Professor Midgley. However, it is envisaged that NFSP will not be based at a single institution, but will be implemented by a coordinated research plan undertaken at multiple institutions in South Africa.</p> <p>A survey conducted among practitioners revealed the relative inexperience in design flood estimation by many of the practitioners and wide spread use of some of the simpler approaches. The initiation of the NFSP implemented at multiple institutions is an opportunity to grow research capacity and to train future practitioners through postgraduate research and to develop reliable and consistent methods of estimating design floods in South Africa.</p>



Collaborative Parties	Description
Project: Pavement Modelling for Sustainability	
University of Illinois, (USA) Brunel University, London, UK Central University of Technology (SURT research group)	<p>Prof Mostafa initiated contacts with the Illinois Centre for Transport (ICT) in 2014 and Brunel University in 2016. He visited the ICT in January 2015 and agreed on activities for 2015 and beyond. Brunel university joined the project in 2016. The project is looking at modelling of pavement for sustainability with focus on modelling of pavement incorporates non-conventional materials.</p> <p>In a time of decreasing highway funds and increasing expectations for performance and quality, it has become more important to understand the effect of environmental conditions on hot-mix asphalt (HMA) pavement performance. Considering the significant role of roadways in the economy and communication activities of the modern societies, researchers have been searching on ways to attain the most suitable road pavement behaviour and consequently design and construct safe, stable, cost-effective and environmentally friendly roads.</p> <p>Although, structural collapse in a flexible pavement structure is caused by the evolution of different types of damage mechanisms; fatigue cracking, advanced crushing, temperature variation and increased moisture content resulting to delamination. The design standard adopted for this research will focus on South African and American code for flexible road pavement design. The use of finite element method to determine the stress-strain non-linear response behaviour of the pavement model structure considering mechanistic-empirical design guide will be developed. The analysis of pavement structures, using finite element method which allows for the implementation of constitutive models that can properly capture the non-linear behaviour of unbound aggregate layers will be considered. The general purpose finite element program ABAQUS, which has been used to study pavement conditions such as multiple wheel loads, unbound aggregate behaviour, non-linear behaviour, and anisotropy will be implemented to determine the stress intensity of the road pavement. Necessary data, required for the analysis will be acquired within situated study locations; since this forms the basis of the design for a reliable sustainable design. By the end of this research, data generated will be used in the design of hybrid flexible road pavement in other to enhance a national sustainable development and enhance growth and development of the South African economic sector in the transportation of goods and agricultural products from state to state within the country.</p>



Collaborative Parties	Description
<p align="center">Project: Sustainable Transportation Framework</p>	
<p>Central University of Technology (SURT research group)</p> <p>Free State University</p>	<p>Mountains and highlands have always played an important role in the history of humankind and have been sources of valuable assets – freshwater, refuges, natural barriers, and spiritual sanctuaries, to mention a few. Yet, for the most part, they have been viewed as peripheral to the rest of the global ecosystem, with an associated lack of attention to their sustainable development. Mountainous regions face important developmental questions concerning ecosystem services, as well as climate change. Although there is growing international interest in montane environments and livelihoods, the 'montane' element of South Africa/Lesotho has not been adequately recognised in research or planning terms.</p> <p>The Drakensberg Montane Grassland, Woodland and Forest ecoregion is the centre of southern Africa's Afromontane region. It is the southernmost point of the Afromontane regional centre of endemism, and supports endemic plants, amphibians, birds and reptiles. The highest portions of this ecoregion have been equated to Alpine tundra vegetation by some researchers. Unlike mountains further north where Afromontane communities are found only above 2000 metres, here latitude compensates for altitude, allowing Afromontane communities to occur down to sea level. These mountains supply the industrial heart of South Africa with water, and give rise to southern Africa's longest river, the Orange River.</p> <p>The QwaQwa Campus of the UFS is ideally suited to be the home of a research unit that harnesses interdisciplinary expertise to focus on addressing the sustainable development of this important montane area. Sustainable development promotes the idea that social, environmental and economic progress are all attainable within the limits of earth's natural resources. While development is needed to overcome issues of poverty and unequal distribution of wealth and resources, this development must be sustainable so as not to cause the same problems of environmental degradation that were caused in the past. It is also necessary to understand and appreciate the unique histories and cultures of these regions.</p> <p>The area which will form the primary focus of the activities stretches across two countries - South Africa (Free State, KwaZulu-Natal and the Eastern Cape) and Lesotho, incorporating more than 600km of mountain range. The area is prone to a number of environmental stresses, including land degradation and loss of biodiversity – with associated effects on the communities who live there. Under predicted climate change conditions these stresses will get more pronounced and hence undermine sustainable development efforts.</p>



Collaborative Parties	Description
Project: Unsaturated Soils Mechanics for Engineering Practice (UnsatPractice)	
Central University of Technology, Free State Durham University, UK Five universities in South Africa University of Pretoria Stellenbosch University University of KwaZulu-Natal Cape Town University Central University of Technology, Free State SZECHENYI ISTVAN University	<p>The unsaturated characteristics of soils give rise to many geotechnical problems in South Africa including collapse of foundations due to inadequate bearing capacity, structural damage due to excessive ground heave, sinkhole formation, slope instability both in terms of natural slopes and man-made embankments, as well as road and railway formation failure.</p> <p>The consortium comprises 13 academic staff and 20 PhD students. The training programme will include: (1) Generic skills training courses, (2) Research subject specific courses (short courses on unsaturated soils in engineering practice, finite element analysis, site investigation and ground improvement techniques, physical modelling and laboratory testing, for example), (3) Communications workshops and seminars, (4) Online training (5) organisation of a conference for PhD students working on unsaturated soils. The network partners will generate significant follow-on projects by seeking new research funding from national and international research councils and agencies. The network partners will establish long-term sandwich PhD programmes</p> <p>Collaboration will be with Faculty of Engineering Science: Department of Structural and Geotechnical Engineering as well as the Department of Transport Infrastructure and Municipal Engineering on expansive soils.</p> <p>Levels of collaboration: Exchange of Staff; Exchange of PhD Students; Co-supervision of students</p>
Project: Research collaboration: project supervision and funding applications	
Arditi University, Tanzania	Prof Emuze visit ARU in March 2016 and a MoU between ARU and CUT was subsequently signed to foster collective efforts regarding construction research in developing countries.
Project: Research collaboration with Mr D Louw and Mr T du Plooy, National Rental Pool Program.	
CSIR, National Laser Centre	Collaboration in the fields of research of optical diagnostics of selective laser melting. Carrying out of joint experiments, discussion of results, writing joint articles and joint master student supervision.
Project: Research collaboration with Dr A Donmez and Dr S Mekhontsev under SARCHI and CPAM programs	
National Institute of Standards and Technology, USA	Collaboration in the fields of optical monitoring of selective laser melting process (SLM), discussion of results and writing of joint articles.
Project: Research collaboration with Prof DG Hatting in Materials Science under SARCHI and CPAM programs.	
Nelson Mandela Metropolitan University	Collaboration in the field of residual stress of SLM objects, discussion of results and writing of joint articles.
Project: Research collaboration with Prof M Schmidt in the field of Laser Processing under SARCHI program.	
Friedrich-Alexander Universität Erlangen-Nürnberg, Germany	Collaboration in the field of Selective Laser Melting, Materials Science, discussion of results and writing of joint articles.



Collaborative Parties	Description
Project: Research collaboration with Dr T Becker, Dr A du Plessis, Prof D Dimitrov in Materials Science and Metrology under SARCHI and CPAM programs.	
Stellenbosch University	Collaboration in the fields of research of materials science of Ti6Al4V alloy manufactured by DMLS process, discussion of results, writing joint articles and joint master and doctorate student supervision.
Project: Research collaboration with Prof P. Krakhmalev in Materials Science under SARCHI and CPAM programs.	
Karlstad University, Sweden	Collaboration in the fields of research of materials science, advanced materials, multimaterials. Carrying out of joint experiments, discussion of results and writing of joint articles.
Project: Research collaboration with Prof J Van Humbeeck under SARCHI and CPAM programs.	
Katholieke Universiteit Leuven, Belgium	Collaboration in the fields of research of materials science and advanced materials. Carrying out of joint experiments, discussion of results and writing of joint articles and book chapters.
Project: Research collaboration with Prof C Polese.	
Research collaboration under SARCHI and CPAM projects.	Collaboration in the fields of research of materials science, advanced materials and laser shock peening (LSP) technology, joint master's student supervision.
Ecole nationale d'ingénieurs de Saint-Etienne, France	Collaboration in the fields of Selective Laser Melting with Prof I Smurov, carrying out of joint experiments, discussion of results and writing of joint articles.
Project: Research collaboration under SARCHI project.	
Vitebsk State Medical University	Collaboration in the fields of Medical Product Development through Additive Manufacturing with Prof A Kabanova, joint investigations and papers.
Project: Research Collaboration with Prof Peter Mendonides, Mr B van As, Mr S Havenga under the CPAM	
Vaal University of Technology	Collaboration on AM of Ti6Al4V, surface finishing of Polymer AM and Design for AM. Joint masters and doctorate supervision.
Project: Research Collaboration with Prof Deon de Beer under the CPAM and Platform	
North-West University	Collaboration on Polymer AM, Design for AM and AM of platinum
Project: Collaboration with Dr Kevin Slattery on support for a master's study	
Boeing Research and Technology	Collaboration on AM of Ti6Al4V from blended powder
Project: Research collaboration with Dr Lethu Chikocha, Mr Pierre Rossouw and Mr Chris McDuling under the CPAM	
CSIR Materials Science and Manufacturing	Collaboration on characterisation of Ti6Al4V powder for AM, AM patterns for investment casting and mechanical testing of AM parts. Joint master's supervision.



Collaborative Parties	Description
Project: Research collaboration with Prof Francis Smit and the Robert WM Frater Centre for Cardio-vascular Surgery	
University of the Free State	Collaboration on the development and testing of mechanical and polyurethane heart valves
Project: Collaboration with Dr Ettienne Snyders en Dr Jaco van der Walt under CPAM	
Nuclear Energy Corporation of South Africa (Necsa)	Collaboration on characterisation of Ti6Al4V powder, spheroidisation of powder and AM of plasma system components
Project: Collaboration with Mr Awie Viljoen under CPAM	
Altech UEC South Africa	Collaboration on design rules for AM tooling inserts
Project: Collaboration on design for AM under CPAM	
Technimark	Collaboration on design of AM tooling inserts in maraging steel for high volume plastic injection moulding
Project: Collaboration with Prof Rob Knutsen of the Materials Engineering Centre under CPAM	
University of Cape Town	Collaboration on the physical metallurgy of titanium alloys produced through AM
Project: Research collaboration with Mr D Louw and Mr T du Plooy, National Rental Pool Program.	
CSIR, National Laser Centre	Collaboration in the fields of research of optical diagnostics of selective laser melting. Carrying out of joint experiments, discussion of results, writing joint articles and joint master student supervision.
Project: Research collaboration with Dr A Donmez and Dr S Mekhontsev under SARCHI and CPAM programs.	
National Institute of Standards and Technology, USA	Collaboration in the fields of optical monitoring of selective laser melting process (SLM), discussion of results and writing of joint articles.
Project: Research collaboration with Prof DG Hatting in Materials Science under SARCHI and CPAM programs.	
Nelson Mandela Metropolitan University	Collaboration in the field of residual stress of SLM objects, discussion of results and writing of joint articles.
Project: Interactive lecture: students of Control systems 3 class interacting	
University of Ulm	Prof W Commerell and Mr RB Kuriakose assisted Control systems 3 respective students of the two with their counterparts in University of Ulmuniversities to setup lectures on various topics. The students then exchanged these lectures via Skype and conducted a question and answer session afterwards.



A person with brown hair in a ponytail, wearing a white lab coat, is seen from behind, working in a laboratory. They are holding a small glass vial. The background shows various laboratory equipment, including glass bottles, flasks, and a fume hood. The scene is brightly lit, and the overall atmosphere is professional and scientific.

FACULTY OF HEALTH AND ENVIRONMENTAL SCIENCES

PART 6

A message from the Dean

The nature of research in the Faculty of Health and Environmental Sciences defines the intellectual climate of the Faculty. I am truly passionate about the intellectual energy and scholarly productivity generated by our staff and students. We must address the most pressing problems facing society – problems with, water, food, health, and the environment – and do it in a sustainable, ethical, and humane way.

You already know of CUT Faculty of Health and environmental Sciences as home to international breakthroughs in research. To wit, one of the major achievements includes among others the discovery of a new drug target that has immense potential to help fight aquatic animal infections caused by aquatic parasites. The year 2016 saw the emergence of the entrepreneurial spirit culminating in our centre competing successfully in the 9th SAB beer brewing challenge.

One of the noteworthy events to occur in the year under review was the significant increase of high impact publications in accredited journals. We will expand our research enterprise to address our nation's most difficult and pressing technological problems.

The challenge is to continue creating an enabling environment that inspires researchers to achieve their ambitions and attracts the most talented academics and scholars.

I am certainly proud of our achievements in 2016 and wish to thank all researchers, managers, and staff, for their support, dedication and hard work.



Prof. S.S. Mashele
Dean: Health and
Environmental Sciences



A message from the Assistant Dean: RIE

It is exciting to see that most of the key focus area of research in the Faculty seek to address issues and challenges that affect our communities directly and indirectly. It is also important to note from the report that most of the research outputs achieved were from our postgraduate students and some of these outputs were published on a high impact journals.

These achievements were made possible mainly by the Unit for Drug Discovery Research led by Prof SS Mashele and Dr K Syed and also by the Centre for Applied Food Safety and – Biotechnology (CAFSaB) led by Prof Lues. It is encouraging to see a growing number of our academics obtaining master's and doctorate degrees. Again we are also elated by the ever increasing external financial support, mostly from NRF and DHET.

The Faculty remain committed in recruiting good quality students who are innovative and to give them the best learning experience. We ensure quality through vigorous quality control measures within the Faculty ensuring that the research we produce is not only of good quality but it also adhere to ethics and endorse good research conduct. However, it is very important at all times to try to ensure that my possible interventions and undertakings should lead to:

- Increased throughput of postgraduate students;
- Increase in number of publications in subsidy bearing journals;
- Increased 3rd stream income for CUT;
- Confident and potent staff (supervisors/ lecturers) that can improve training to pre- and postgraduate students.

This report represents the culmination of many hours of hard work and we would like to acknowledge everyone in the Faculty of Health and Environmental Sciences who has contributed and also encourage others to learn from our achievements.

The Faculty of Health and Environmental has two flagship projects Unit for Drug Discovery Research, UDDR and Centre for Applied Food Safety and – Biotechnology, CAFSaB.

This report represents the culmination of many hours of hard work and we would like to acknowledge everyone in the Faculty of Health and Environmental Sciences who has contributed and also encourage others to learn from our achievements. ”



Prof Carlu van Westhuizen
Assistant Dean: Faculty Research
Innovation and Engagement

Unit for Drug Discovery Research

The Unit for Drug Discovery Research (UDDR) hosted Prof. Jack Tuszyński, a world-renowned bioinformatics scholar from the University of Alberta, Canada, to share his research work in computational drug discovery model with postgraduate students and academics at CUT.

Prof. Mashele, Prof. Syed, and Dr Olivier were the main hosts of the event held on 30 October 2016.



Syed, Prof S Mashele and Dr D Olivier with students attending the workshop

Centre for Applied Food Safety and Biotechnology, CAFSaB.

Since the early days of hosting Activity 6 under the NRF's ICDP, following the achieving of Developed Research Niche Area status at the NRF to the current CUT centre status we have enjoyed numerous milestones and successes.



The awarding of CUT centre status in 2015 that reflects the institutional acknowledgement of, and trust in the critical mass, expertise and strategic positioning of the groups is both encouraging and daunting as it reiterates the expectation to uphold and improve excellence and output, both amongst faculty and institutionally. In terms of specialist fields, we currently specialise in food effluent characterisation, novel; antimicrobials and preservatives, fermentation and product development, biofuels from food waste and renewable technologies, food pathogens in health care settings, food handler behaviours, biofilms and cytotoxicity, safety of feeding schemes and many others. We are also looking to, in response to Vision 2020 and the CUT's entrepreneurship and innovation agendas, advance our support to students and staff in terms of entrepreneurial education, patenting, commercialisation and spin-off of novel inventions and discoveries in our field. To this end we are establishing new collaborations with several strategic partners from industry, academia, government and broader society. With our new facilities and brand, and unwavering support from management we are excited to explore and unlock the secrets and opportunities that the future holds.

Agriculture

Under the leadership and guidance of Mr Khetsha, the Sunrise Pre-school was identified to develop a sustainable garden project in the Namibia community, Bloemfontein. A group of 3rd year students and AgriSO (mostly composed of first year students, for organisational succession purposes) formed part of the project establishment which was on the 2 September 2016. To establish this project, a guided innovative vegetable garden was developed using recycled tyres (and also open field plots). Students erected four plots of Swiss chard (spinach), one plot each of cabbage, carrots and beetroot separately. Using innovative agricultural knowledge, students used tyres (cut with a jigsaw) to plant Swiss chard and cabbage together in tyres filled with compost. They also planted potatoes using the technique of stacking tyres for increased yields. During this project, students had a chance to share production techniques and will follow it up (during their next visit) with a production guidance plan on how to sustain the garden (until harvest).

Community engagement:
Sunrise – Preschool Gardening Project



Department of Clinical Sciences

Prof MacKinnon visited the faculty from 21 to 30 November 2016. Dr Daleen Struwig presented an article writing workshop for the Department of Clinical Sciences on 28 and 29 November 2016 and by doing so assisted the department in attaining their publication outputs for 2016.

1 - Ms N Nigrini, Prof J Mackinnon, Ms B Mooketsi and Prof S Mashele

2 - Radiography students participating in the CUT and Hanze University Internship Mentorship programme.
Front row: (from left to right) Dr J du Plessis, Ms L Molony, Prof J McKinnon, Dr D Struwig, Mrs I Sebelego.
Back row: (from left to right) Mrs H Muller, Dr B van der Merwe, Mrs M Ramos-Swanepoel, Mr, M Phahlamohlaka, Mr R Slabbert.



Department of Life Science

During Heritage Month (September 2016, Dr Idah Manduna and Dr Ntsoaki Malebo took part in the Joint Art and Indigenous Knowledge Systems (IKS) exhibition - collaboration between the Faculty of Health and Environmental Sciences and the Faculty of Humanities. Mr Mathabo Zulu, the keynote Speaker for the IKS activities, described African Meta Science and highlighted the importance of IKS and its relevance for future generations. On 22-23 September 2016, indigenous knowledge holders and research partners exhibited their products. Mr Maele Ntjane and Ms Silvia Mofammere from the Kopanag Dingaka Traditional Healers' Association showcased their plant -derived traditional medicines

and Masters Students from CUT presented posters on the scientific validation of the efficacy of the medicinal plants. The Kobo family and other representatives from Thitapoho Farm exhibited plant products such as soaps, bath salts, balms and essential oils. They also served traditional indigenous vegetables and snacks during the exhibition. The CUT community had the opportunity to see how modern science meets tradition as well as how traditional knowledge can be used for entrepreneurship.





Completed Master's Degrees

- Boaduo, N.A.A. 2016. Microbial- and food-safety-related hazards associated with childcare facilities in the Free State. Central University of Technology, Free State.
- Hlongwane, N.L. 2016. Breeding admixture of cattle populations kept in the Thabo Mofutsanyane District. Central University of Technology, Free State.
- Kotze, B. 2016. Addressing mobile neonatal image quality through an educational programme. Central University of Technology, Free State.
- Motolwana, A.S. 2016. Effect of dietary inclusion levels of diatomaceous earth on production and carcass characteristics of broilers. Central University of Technology, Free State.
- Motsumi L. 2016. Proximate analysis and microbial aspects of donkey (*Equus asinus*) biltong in Botswana. Central University of Technology, Free State.
- Ngobeni B. 2016. Pharmacological evaluation of extracts from *Buxus macowanii*, *Polygala myrtifolia*, *Scilla* sp. and *Xanthocercis zambesiaca*. Central University of Technology, Free State.

Completed Doctorate Degrees

- Ebenebe, P. 2016. Evaluation of trace elements in the environment around the Lejweleputswa area of the Free State, South Africa." Central University of Technology, Free State.
- Foster, L. 2016. The profitability and production of a beef herd on transitional Cymbopogon – Themeda veld receiving three different levels of lick supplementation. Central University of Technology, Free State.

List of conference posters

- Friedrich-Nel, H. 2016. Mirror-mirror on the wall - Is IPE the fairest of them all? SAAHE Conference 2016. Boardwalk Conference Centre Port Elizabeth, 22 - 24 June 2016.
- Rathebe, P.C., Weyers C. and Raphela, S.F. 2016. Evaluation of exposure to extremely low frequency magnetic fields in the residential areas of Mangaung Metropolitan Municipality. SAIOH Annual Conference 2016 (Blyde Canyon Forever Resort, 26 - 28 October 2016).
- Zeelie, L., DE Smidt, O. and Lues, J.F.R. 2016. Conventional culturing: selective media competing for the detection of *Listeria monocytogenes* on foodstuffs. International Union of Food Science and Technology (IUFOST): Dublin, Ireland, 21 – 25 August 2016.

List of conference papers

- Roberts, H.A. 2016. Impact of abattoirs and landfills on climate change in the Free State Province, South Africa. 6th International Symposium on Energy from Biomass and Waste, Venice, 14 - 17 November 2016.
- Van Der Westhuizen, C. 2016. Challenges brought about by integrating multiple stakeholders into farm management mentorship of land reform beneficiaries in South Africa. 18th International Conference on Farm Management and Agricultural biosecurity. Los Angeles, California. 5 - 6 April 2016.

Van Der Westhuizen, C. 2016. Admission challenges facing agricultural learners at tertiary institutions. 7th Annual National Conference of the Association of South African Agricultural Educators (ASAAE). Bloemfontein, 4 - 6 February 2016

Van Der Westhuizen, C. 2016. Can extension and advisory services build productive linkages with relevant stakeholders and identify growth opportunities for the farmers? 6th Annual Extension and Advisory Services Conference. Aldam Estate, Ventersburg, 10-12 February 2016.

List of conference proceedings

De Smidt, O., Keller, M., Van Der Merwe, F.C., Koikoi, L.M. and Le Roux, F.P. 2016. Biostimulation for treatment of abattoir effluent in a batch bioreactor. International Scientific and Practical Conference; BRICS Water Forum: Moscow, Russia, 29-30 September 2016.

Du Plessis, J. 2016. Work-integrated learning in radiography training: areas of good practice and areas for improvement. SAAHE Conference 2016, Boardwalk Conference Centre, Port Elizabeth, 22 - 24 June 2016.

Du Plessis, J. 2016. Work-integrated learning in radiography training: areas of good practice and areas for improvement. SoTL Conference, 29 - 30 October 2016.

Esterhuizen, L. and Fossey, A. 2016. Water health index for ground water in the Free State, South Africa. BRICS Water Conference, Moscow, Russia 29 -30 September 2016.

Friedrich-Nel, H. 2016. Inverting the radiography classroom. Education workshop ISRR conference COEX, Seoul, South Korea, 19 - 22 October 2016.

Le Roux, F.P., De Smidt, O., Esterhuizen, L. and Botes, E. 2016. Water quality and coliform diversity of municipal water in Brandfort, Free State. Water Institute of Southern Africa (WISA), Durban, 15-19 May 2016.

Pretorius, R.J., Bradshaw, J.D. and Hein G.L. 2016. Ecologically-based pest management on the US central High Plains: Structuring a better environment for conservation biology to work in sugar beet. 25th International Congress of Entomology, Orlando, Florida, United States of America, 25-30 September 2016.

Sebelele, I.K. 2016. Using clickers to enhance teaching and learning of Radiography students. Teaching and Learning Conference, Central University of Technology, Free State, Bloemfontein, 13 - 14 June 2016.

Smith, E.M. and De Smidt, O. 2016. The influence of extrinsic stresses on the toxicity of *Escherichia coli* and *Pseudomonas aeruginosa* as quantified by porcine IL-6 production. International Union of Food Science and Technology (IUFoST): Dublin, Ireland, 21-25 August 2016.

Slabbert, R. 2016. Extended Curriculum Evolution: A Road Map to Academic Success. Annual ECP colloquium, Central University of Technology, Free State, Bloemfontein, 30 - 31 August 2016.

Van Der Merwe, B. 2016. The flexible learning environment. CUT SoTL conference, Central University of Technology, Free State, Bloemfontein, 29-30 October 2016.

Van Der Merwe, B. 2016. Flexible learning. International Consortium for Educational Development (ICED) and HELTASA joint Conference. Cape Town. 23-25 November 2016.



List of Journals/Articles (DHET subsidised)

- Foster, L.A., Fourie, P.J. and Naser, F.W.C. 2016. A survey of lick supplementation and management practices of commercial beef farmers in the Zastron district. *S. African J. Agric. Ext.* 44(2): 158-166.
- Long, D., Friedrich-Nel, H.S. and Joubert, G. 2016. Brachytherapy for cervical cancer: guidelines to facilitate patient-centred care in a multidisciplinary environment. *Southern African Journal of Gynaecological Oncology*, 8(2): 27-33. December 2016.
- Pieterse, T., Lawrence, H. and Friedrich-Nel, H. 2016. Critical thinking ability of 3rd year radiography students. *Health SA Gesondheid*, 21, pp. 381-390.
- Swanepoel, H., Lues J.F.R. and Venter P. 2016. The contribution of fatty acids to the composition of the total lipids in juvenile Cape hake fillets". *Journal of New Generation Sciences*, 14(3): 247-258, December 2016.

List of Journals/Articles (not DHET subsidised)

- Achilonu, I., Nwafor, C. Umesiobi, D.O. and Sedibe M. 2016. Biochemical beneficiation of pumpkin (*Cucurbita moschata*) on general wellbeing of poultry species. *Journal of Animal Physiology and Animal Nutrition*.
- Bortz J and Friedrich-Nel H. 2016. The Adenoma-Carcinoma Sequence, Management and Treatment of Colon Cancer in CT Colonography for Radiographers edited by Bortz, Joel H., Ramlaul, Aarthi, Munro, Leonie (Eds.) Springer International Publishing Switzerland. ISBN 978-3-319-29379. p211 – 219.
- Long, D., Friedrich-Nel, H.S. and Joubert, G. 2016. Patients' informational needs while undergoing brachytherapy for cervical cancer. *International Journal for Quality in Health Care*, 28(2): 200-208.
- Motsomi, K., Makanjee, C., Basera, T. and Nyasulu, P. 2016. Factors affecting effective communication about sexual and reproductive health issues between parents and adolescents in Zandspruit informal settlement, Johannesburg, South Africa. *The Pan African Medical Journal*, 25.
- Mfengwana, P.H. and Mashele, S.S. 2016. Antimicrobial Activity Screening of *Philenoptera violacea* (Klotzsch) schrire and *Xanthocercis zambesiaca* (Baker) Dumaz-Le-Grand. *Journal of Pharmaceutical Sciences and Research*, 8(10): 1132-1135.
- Ntsoelinyane-Mfengwana, P.H. and Mashele, S.S. 2016. Evaluation of mutagenicity, antimutagenicity, cytotoxicity and compound identification of *Philenoptera violacea* (klotzsch) schrire and *Xanthocercis zambesiaca* (baker) dumazle-grand methanolic extracts in vitro. *Pharmacologyonline*, 3, 174-185.
- Parvez, M., Qhanya, L.B., Mthakathi, N.T., Kgosiemang, I.K.R., Bamal, H.D., Pagadala, N.S., Xie, T., Yang, H., Chen, H., Theron, C.W. and Monyaki, R. 2016. Molecular evolutionary dynamics of cytochrome P450 monooxygenases across kingdoms: Special focus on mycobacterial P450s. *Scientific Reports*, 6.
- Pretorius, R.J., Hein, G.L. and Bradshaw, J.D. 2016. Ecology and management of *Pemphigus betae* (Hemiptera: Aphididae) in sugar beet. *Journal of Integrated Pest Management* 7(1): 10; 1-9. DOI: 10.1093/jipm/pmw008.
- Pretorius, R.J. 2016. The stink bugs (Hemiptera: Pentatomidae). *S.A. Vegetables & Fruit*. Jul/Aug issue, no. 172, p. 29.
- Pretorius, R.J. 2016. The ants (Hymenoptera: Formicidae). *S.A. Vegetables & Fruit*. Sep/Oct issue, no. 172
- Pretorius, R.J. 2016. The hover flies (Diptera: Syrphidae). *S.A. Vegetables & Fruit*. Nov/Dec issue, no. 174
- Pretorius, R.J. 2016. The termites (Insecta: Isoptera). *S.A. Vegetables & Fruit*. Jan/Feb issue, no. 175.
- Pretorius, R.J. 2016. The mayflies (Insecta: Ephemeroptera). *S.A. Vegetables & Fruit*. Jan/Feb issue, no. 169.
- Pretorius, R.J. 2016. The honey bees (*Apis* spp.). *S.A. Vegetables & Fruit*. Jan/Feb issue, no. 170.
- Pretorius, R.J. 2016. The blister beetles (Coleoptera: Meloidae). *S.A. Vegetables & Fruit*. May/Jun issue, no. 171
- Pretorius, R.J. 2016. The termites (Insecta: Isoptera). *S.A. Vegetables & Fruit*. Jan/Feb issue, no. 175.
- Van Der Spoel Van Dijk, A. Makhoahle, P. Rigouts, L. and Baba K 2016. Diverse Molecular Genotypes of *Mycobacterium tuberculosis* Complex Isolates Circulating in the Free State, South Africa. *International Journal of Microbiology* doi:10.1155/2016/6572165.

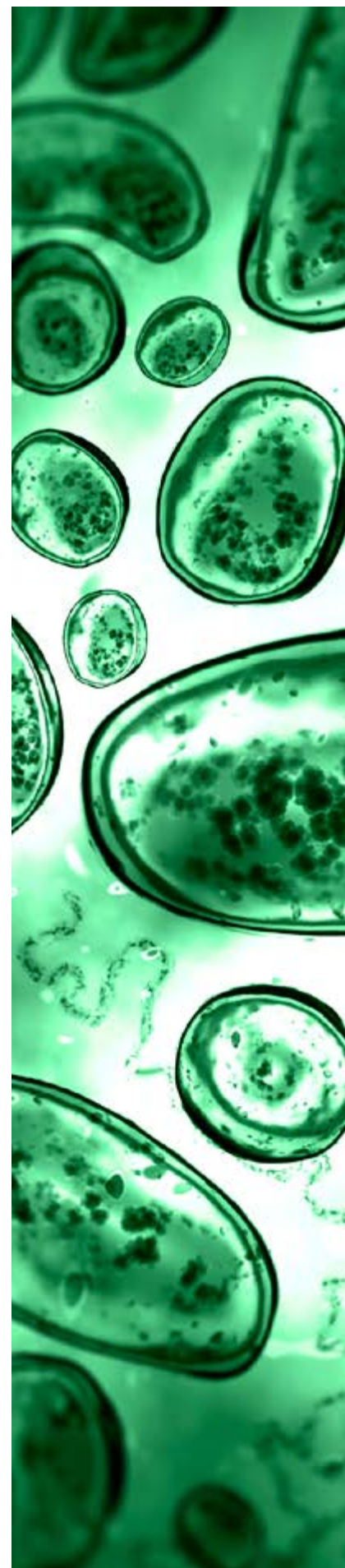
Visiting Professors

Prof Joyce MacKinnon from Indiana University in Indianapolis, USA visited the Faculty of Health and Environmental Sciences from 21 to 30 November 2016. During the visit Prof Mac Kinnon contributed to a manuscript and participated in the article writing workshop in the Department of Clinical Sciences. She contributed to two chapters in books, one published in 2016 and another will be published in 2017.

Fostering Strategic partnerships

A summary of faculties' strategic partnerships

Institution	Nature of partnership
Ghent University, Belgium University of West Scotland	Recognised agreements signed with CUT and both universities. Partnerships are in place for staff and student exchange between the CUT and both universities.
University of Oslo Akershus (HiOA)	Two year (short term) funded partnership. Two CUT 4 th year radiography students will visit Norway in 2017 for three months.
Grootfontein Development Institute	Research Collaboration
Agriculture research council (ARC)	Research Collaboration





**FACULTY OF
HUMANITIES**

PART 7

A message from the Acting Dean

During the period under review the then dean of the faculty Prof D P Ngidi was promoted to the post of Deputy Vice Chancellor (DVC) Teaching and Learning. On behalf of the Faculty of Humanities I would like to congratulate Prof Ngidi on his promotion. You made our faculty proud and we wish you well in your new portfolio. Following Prof Ngidi's promotion, I was then privileged to take over the reigns as the acting dean for the faculty. In that capacity, it is my singular honour and privilege to present an overview of the research related activities for the faculty. I would like to start by thanking all the members of the faculty who supported me during this period under review by contributing to the outputs that I am reporting on. The faculty graduated 10 Masters' and 4 Doctoral candidates, a slight improvement when compared to 10 Masters and 2 Doctoral candidates in the previous year. However, the faculty made a huge improvement when it comes to journal publications and conference papers. A total of 21 journal articles were published and a record total of 63 conference papers were read at both national and internal conferences. Well done colleagues! In the previous year 18 articles were published in accredited journals and 39 conference papers were read at both national and international conferences. The bumper harvest especially of conference papers is attributed to our successful visit to Thailand universities where 14 papers were read at the International

Conference on Science and Social Sciences (ICSSS), 22-23 September 2016 Rajabhat Maha Sarakham University (RMU). This visit to Rajabhat Maha Sarakham was also a follow up on 3 MOU's that had been signed by Prof Ngidi between CUT and 3 Thailand universities in the previous year (October, 2015). In relation to the above said ICSSS conference, I was privileged to deliver a key note address titled: *Towards sustainable well-being through curricular community engagement: A South African perspective*. As I write this report, a new dean for the faculty has been appointed and so I'm hoping faculty members will continue to give the same support that both myself and Prof Ngidi have enjoyed. Let me now hand you over to the Assistant Dean Research Innovation & Engagement who will then give a more detailed account of the research activities that have summarised.



Prof Frances Van Schalkwyk
Acting Dean:
Faculty of Humanities





A message from the Assistant Dean: RIE

It is my singular honour and privilege once more to present the Faculty of Humanities' Research and Innovation Report for 2016 in my new portfolio as Assistant Dean Research Innovation & Engagement.

Assuming there are readers who might have been following the CUT Research Reports annually from 2013 to date, one might immediately notice the change in the titles from Research Manager to Assistant Dean Research Innovation & Engagement.

The inclusion of 'innovation' and 'engagement' in this new title was in line with an almost universal view that the outcomes of research should lead to relevant and sustainable benefits to the communities where the research is undertaken.

So in order for research to be relevant, researchers should constantly engage with those communities with whom and for whom research is being carried out. In line with this view, CUT's vision 2020 statement places specific emphasis on completed **research** by CUT researchers assisting corporate entities with the development of new products and processes (**innovation**) which in turn should lead to the establishment of new enterprises by Small, Medium and Micro Enterprises (SMME's).

In the 2015 Annual Report, I gave a very brief summary on the developments leading to an international collaboration between the University of Free State, Maha Sarakham University, Chiang Mai University, Rajabhat Maha Sarakham University and the Central University of Technology. In 2016 our collaborative efforts were taken to the next level and three MOUs were signed. Plans are at an advanced stage to roll out some collaborative research projects with these universities. Having provided this brief overview, the report now goes into more detail on these activities.



Prof Mike Mhlolo
Assistant Dean – Research
Innovation & Engagement

Annual Prestige Research Seminar



On 11 October 2016, the Faculty of Humanities at CUT hosted an Annual Prestige Research Seminar to foster staff members, postgraduate students, and academics to share their research endeavors, innovations, models, theories and strategies that address the issues and challenges related to cultivating communities for interdisciplinary and trans disciplinary research in the faculty.

The keynote Speaker and Head of Department: Economic and Management Sciences at the School of Social Sciences and Language Education in University of Free State, Dr. Molaodi Tshelane, presented on '*The changing context of Higher Education research in Africa*'. Based on his topic, Dr. Tshelane said that universities in democratic societies must go beyond professional curriculum practice, which is essential to understand how students learn and at the same time, forms part of a fundamental life plant of every research institution.

He also mentioned the three main aspects of a university – to educate, conduct research and translate research as positive effects in a changing society. He also mentioned the current uncertainties vis-à-vis the future of students in higher education, which he said, are due to the structural challenges that were overlooked in the past 22 years. "The aim of education is tied to the nature and epitomes of a particular society. Today we are forced by our students to pause a little, listen and remind ourselves of the objectives of a university. The recent aims promoted by the #fallism movement in South Africa clearly showed narrow thinking and requires us to talk to the question: whose agenda are we serving? To unmask this hidden agenda, we should demand more from universities than to educate people to be proficient in reading mathematics," he said.

Emerging researchers and scholars from both Bloemfontein and Welkom campus present their research work and shared their accomplishments; received words of encouragement and in return, they received positive feedback and constructive criticism from experienced researchers. Presenters included Ms Nandi Lessing-Venter, Dr Luzaan Schlebusch, Mr Gustav Macklin Barnard, Mr Boitumelo Molokwane, Ms. M Phakisi, Department of Pure Sciences, Lesotho College of Education in Lesotho; Mr Martin Challenor, Ms Elena Baldea, Mr Pocian Tagutanazvo, Ms MB Maope, Ms Ntoatsabone Jeanette and Mr Joel Johannes de Lange, Head of Department: Accounting, Goudveld High School.



Dr Molaodi Tshelane



Conference Attendance in Bangkok - Thailand

Our internalization activities for 2016 kicked off in early March. Tomorrow People, an internationally recognized non for profit organization, organised its 11th Annual Education and Development Conference which took place from 5-7 March 2016, at Aetas Lumpini hotel in Bangkok, Thailand. Five members from the Faculty of Humanities attended this conference and presented the following papers;

- *Managing teaching and learning in Postgraduate programmes in a University of Technology: Challenges and Prospects (Prof. Alfred H Makura)*
Student teacher's conception on the use of formative assessment in the classroom (Dr. Wendy Setlalentoa)
- *High school teachers' preparedness for the identification and nurturing of the mathematically gifted learners (Prof. Michael Kainose Mhlolo)*
- *Proposing Guidelines for the Implementation of Multicultural Initiatives in Integrated Schools of South Africa (Prof. Gregory Alexander)*
- *Instructional Leadership Efficacy of secondary school principals in the Free State province of South Africa (Prof. Sheila Matoti)*

The group photos capturing the participants from different parts of the world. The reason why this conference attendance is being presented under internationalisation activities is because it was felt that since members were already in Thailand for the conference and that we had just signed 3 MOU's with universities in Thailand, here was an opportunity for the members to move these collaborative activities forward. So from the Bangkok conference the team moved further north of Thailand to have some discssions with colleagues in the three universities that we have signed MOU's with. Here are some of the phtotos at the different Thailand universities.



Faculty representative staff visit to Rajabhat Mahasarakham University in March 2016



Faculty representative staff visit to Khon Kaen University in March 2016

Report on its delegation's conference participation and staff visit to Thailand, September 2016

This report highlights the activities and engagements of the Faculty of Humanities during its visit to Thailand for the period, 21-27 September 2016. The report commences with an overview of the activities and engagements of the Acting Dean of Humanities, Prof Frances Van Schalkwyk,

faculty staff presentations, the CUT delegation to Khon Kaen University and Chiang Mai University, respectively and the contribution of CUT, Director: Research Development and Postgraduate Studies, Prof Laetus Lategan during engagements in Thailand.



Staff participation at the ICSSS 2016 conference (International Conference on Science and Social Sciences), 22-23 September 2016

A total of 14 papers were presented by the Faculty of Humanities staff at the ICSSS 2016 conference (please see table below). Six of these papers were published as full conference proceedings papers with ISBN 978-974-8223-79-7. The paper presented by Dr. P Phindane was recently published in an accredited DHET journal. The other presenters (Dr. L Segalo, Ms. M Roodt, Mr. MG Zwane, Ms. B Lenong, Ms. E Dalton and Ms. J Cronje), all committed to develop their papers for earmarked DHET accredited journals before 31 January 2017. Papers of CUT staff were well received at the ICSSS 2016 conference. It needs to be noted that the CUT was a partner (amongst the other 7 international partners)

to the ICSSS 2016 conference, which was hosted by Rajabhat Maha Sarakham University (RMU). The other partners to the ICSSS 2016 conference included, Honghe University (China); the National University of Laos (Nigeria); Yunnan Normal University (China); Roi Et Rajabhat University (Thailand); Southwest Forestry University (China); University of Applied Sciences, Neubrandenburg (Germany); Institute for Research and Development of New Technologies (Vietnam) and the College of Social Sciences and Philosophy University (Philippines). CUT has an official institutional MOU with Rajabhat Maha Sarakham University.

PRESENTER	TOPIC OF PAPER	PAPER STATUS
Prof. G Alexander	The Development of Guidelines for Management Teams in Facilitating Multicultural Education Initiatives in Integrated School Settings	Paper was published in ICSSS 2016 Conference Proceedings book (ISBN 978-974-8223-79-7). A peer reviewed statement was issued by the ICSSS Organizing Committee.
Dr. P Phindane	A comparative study of requests among second language speakers of English	The colleague funded his own trip from his personal research entity. This paper has recently been published in a DHET accredited journal.
Dr. CS Masoabi	The Effects of Student Teams Achievement Divisions (STAD) as a Cooperative Learning Technique on Learners in Technology Classrooms	Paper was published in ICSSS 2016 Conference Proceedings book (ISBN 978-974-8223-79-7). A peer reviewed statement was issued by the ICSSS Organizing Committee.
Mr. A Modise and Prof G Schlebusch	Using Code Switching as a Strategy to LEPgrade 10 Accounting Learners in South Africa	Paper was published in ICSSS 2016 Conference Proceedings book (ISBN 978-974-8223-79-7). A peer reviewed statement was issued by the ICSSS Organizing Committee.
Ms. B Mangwegape	Investigating the Speech Act of Apology in Setswana in South African Higher School Settings	Paper was published in ICSSS 2016 Conference Proceedings book (ISBN 978-974-8223-79-7). A peer reviewed statement was issued by the ICSSS Organizing Committee.
Ms. PL Ndamani	The Leadership Efficacy of Secondary School Principals in the Free State Province of South Africa and its Effect on the School Climate	Paper was published in ICSSS 2016 Conference Proceedings book (ISBN 978-974-8223-79-7). A peer reviewed statement was issued by the ICSSS Organising Committee.
Mr. T Matlho	Envisaging an Ideal Multi-Grade Classroom: From Social Injustice to a Sustainable Learning Environment	Paper was published in ICSSS 2016 Conference Proceedings book (ISBN 978-974-8223-79-7). A peer reviewed statement was issued by the ICSSS Organising Committee.

PRESENTER	TOPIC OF PAPER	PAPER STATUS
Mr. MG Zwane	How prepared is Our First Year Students? Challenges Faced by Lecturers at a University of Technology	The colleague committed to send a manuscript for review to an accredited DHET journal before December 2016.
Ms. B Lenong	Student Experiences of a First-Year Reading Development Course at a University of Technology, Free State	The colleague committed to send a manuscript for review to an accredited DHET journal before January 2017.
Dr. L Segalo	Student Teachers' Experiences of Learner Classroom Behavioural Challenges During Teaching Practice: A Case of BEd Third Year Students at a University of Technology in South Africa.	The colleague committed to send a manuscript for review to an accredited DHET journal before January 2017.
Ms. M Roodt	Reflective Practice as an Integral Aspect of Teacher Education; A Case Study at a University of Technology.	The colleague committed to send a manuscript for review to an accredited DHET journal before January 2017.
Mr. W Manduna	Empirical Study of Digital Poverty: A Case Study of a University of Technology in South Africa.	The colleague conference attendance was approved based on PD (credits) accumulated PD points.
Ms. EJH Dalton	Visual Arts as Context for Sustainable Cultural Heritage Preservation: A Case Study for the Integration of Digital Fabrication Technologies in Ceramics Practices.	The colleague committed to send a manuscript for review to an accredited DHET journal before January 2017.
Ms. J Cronje	Engagement in the Visual Arts: A Way to Negate Assertion Violence and Mass-Mediated Compassion Fatigue.	The colleague committed to send a manuscript for review to an accredited DEHT journal before January 2017.

In relation to the above said activity, Prof Frances Van Schalkwyk delivered a key note address on 23 September at the ICSSS 2016 conference, titled: *Towards sustainable well-being through curricular community engagement: A South African perspective*. Prof Laetus Lategan, the Dean: Research and Innovation at CUT, also delivered a keynote address at ICSSS 2016, titled: *Doctoral Education: A three partner relationship*, on 22 September 2016. During the Conference, Prof Lategan also had extended discussions with Prof. Dr Krasae Chanawongse on public health issues. Prof. Dr Krasae Chanawongse delivered a keynote address on mutual community engagement. Colleagues from the Department of Design and Studio Art, indicated that the ICSSS conference was both informative and of a cross disciplinary nature –it also served as a platform for collaborative engagement and sustainable well-being. Colleagues from the Teacher education related departments at CUT, view the exposure they received via their presentations as empowering. They also regarded other international presentations, as invaluable. It needs to be noted that it was the first time in the Faculty of Humanities history that such a large delegation presented papers at an international conference (15 papers in total). Prof Van Schalkwyk in consultation with FRIC are pronged on having a developmental approach in supporting staff members' research and scholarly capabilities, hence the

motivation from the faculty's side to expose and assist colleagues with their academic careers.

One of the draw backs of the ICSSS 2016 conference, was English communication. As a result, there was limited scientific discourse on fundamental aspects of some presentations.



Visitation to Khon Kaen University

On the 21 September 2016, six members of CUT (Prof. Van Schalkwyk, Prof. Lategan, Prof. Schlebusch, Prof. Alexander, Ms. Cronje and Ms. Dalton) made a courtesy visit to the Faculty of Education, Khon Kean University (KKU). KKU has an official faculty to faculty MOU with CUT. The intention was to meet with Prof. Maitree Inprasitha, Dean of the Faculty of Education, and the Director of the Centre for Research in Mathematics Education and world renowned authority on the lesson study programme (Prof Inprasitha was called to an urgent meeting with the Thai government). The CUT delegation was however welcomed by Dr. Nuchwana Luanganggoon, assistant to the Dean for international relations and academic affairs and Mr Jakkrapong Thongpai, International relations



officer at Khon Kaen University. Views and ideas were shared as to how MOU activities between CUT and KKU could be rolled-out. Prof Lategan made a presentation on CUT's research profile, its research entities and research opportunities. Dr Nuchwana Luanganggoon committed in engaging Prof Inprasitha on key resolutions taken during the meeting.

The way forward with the institutions visited by CUT staff

CUT should continue with its annual participation in the ICSSS conference as a collaborative partner. This conference creates the opportunity to profile the university in the East. A smaller, future delegation should attend the ICSSS conference due to challenges with scientific discourse and the possible link to the Faculty of Humanities, CUT research foci.

- The Faculty of Humanities plays a more active role in the ICSSS conference planning, review of papers and a session on global science and social science education.
- One or two activities be identified for joint research, staff and student exchange. Prof Narongrit Sopa, Director for doctoral programme in Regional Development at Rajabhat Maha Sarakham University proposed a collaborative research project, in which the Faculty of Humanities has pledged its involvement.
- It would be beneficial for the Department of Design and Studio Art (DDSA) at CUT to work together with Chiang Mai University's Faculty of Fine Arts-this is to exchange knowledge and expose CUT students to international collaborative projects.

- CMU's Faculty of Fine Arts has an accessible and professionally maintained gallery that exhibits students' and staff works throughout the year. Important works of staff at CMU is presented in a professional catalogue- this is an aspect that could be explored at CUT.
- Staff in the Department of Design and Studio Art at CUT should be considered for a staff exchange programme with Chiang Mai University's Faculty of Fine Arts. This can be a valuable learning experience for staff and students.
- Staff from Chiang Mai University can be considered to act as external assessors and/or promoters for doctoral studies- this can create a valuable opportunity to enhance the global understanding of a research topic.

Visitation to Chiang Mai University

A smaller delegation, consisting of Prof. Van Schalkwyk, Prof. Lategan, Prof. Schlebusch, Prof. Alexander, Ms Dalton and Ms Cronje, visited the Faculty of Education and the Faculty of Fine Arts at Chiang Mai University (CMU) on the 26 September 2016. The Faculty of Humanities, CUT and the Faculty of Education, CMU have a MOU which is in final draft form (awaiting signatures from both the Vice-Chancellors' of CUT and CMU).

During the **first session** on the 26 September, the CUT delegation met with members of the Chiang Mai University, Faculty of Education's leadership structure, which included the following staff members, namely: Asst. Prof. Soontaree Konthieng, Associate Dean for International Relations and Community Affairs; Asst. Prof. Uraiwan Hanwong, Associate Dean for Academic Affairs; Dr Jensamut Saengpun, Associate Dean for Research and Innovations Affairs and Ms. Abhiratee Abhichatabutr, International Relations Officer. Prof Dr Kiatsuda Srisuk (Dean, Faculty of Education, Chiang Mai University) wasn't present at the meeting with the CUT delegation- she had to attend an urgent Thai Higher Education, Ministerial meeting.

During the second **session** of the 26 September, Prof Van Schalkwyk, Prof Lategan, Ms Dalton and Ms Cronje visited the Faculty of Fine Arts at CMU. The CUT delegation was welcomed by the Head of Department and staff of the Faculty of Fine Arts, Chiang Mai University. The faculty consists of three Departments, namely: The Department of Thai Art; Department of Visual Arts and the Department of Media Arts and Design. Representatives from the Faculty of Fine Arts, comprised of Prof. Kanteewong Thitipol (Assistant to the Dean for International Relations and Academic Services); Dr Swathanan, Sakda, (Principal) and Ms Han-gla, Meviga (International Relations Officer).

It was further observed by the CUT colleagues that the Department of Visual Arts and Media Arts and Design, offer subjects and curricula that are similar to the Department of Design and Studio Art (DDSA) at CUT. These Departments in the Fine Arts Faculty at CMU appear to offer more traditional processes in certain areas of specialisation, whereas the Department of Design and Studio Art at CUT, tend to be more technologically driven. Various areas were identified for possible, future collaborative projects between CUT and CMU- these include, Ceramics (DDSA niche area), bronze casting (DDSA niche area), printmaking, photographic art and multidisciplinary art.

Prof. Gawie Schlebusch and Prof. Alexander also visited the Demonstration school attached to the CMU, Faculty of Education. The Demonstration school provides a strong academic program for its students and a laboratory for staff and students to do their practice, research and to assess effective teaching methods. The school opened in 1968 and has around 1 800 primary and secondary school learners.



Visit by Thailand delegation



The Faculty of Humanities, Central University of Technology made great progress in extending its international footprint, especially in South East Asia. The Faculty of Humanities, CUT also hosted a delegation from Rajabhat Maha Sarakham University for the period 25-29 October 2016. The delegates had been invited especially for the *SCHOLARSHIP of TEACHING AND LEARNING 2nd INTERNATIONAL CONFERENCE ON SCHOLARSHIP OF TEACHING AND LEARNING*. Below we captured some of those moments where our delegates were involved.



Completed Master's Degrees

- Bester, M.L.C. 2016. The effectiveness of a First-Year Teaching Manual on the Principles of Graphic Design. Central University of Technology, Free State.
- Cronje, J.P. 2016. A preliminary investigation into the roles of interactive engagement in the visual arts. Central University of Technology, Free State.
- Dalton, E.J.H. 2016. Post-discipline transformative arts practice: ceramics processes, digital fabrication technologies and the innovative cultural content appropriation. Central University of Technology, Free State.
- Du Plessis, A.M. 2016. Aesthetic interaction in the visual arts as a measure against anthropocentric attitudes towards the environment. Central University of Technology, Free State.
- Mohatle, S.A. 2016. The portrayal of women in Sesotho Literature with special reference to South African Drama, Poems and Proverbs. Central University of Technology, Free State.
- Mokhothu, K. 2016. The integration of technical subjects in the Civil Technology Curriculum with special reference to FET technical schools. Central University of Technology, Free State.
- Ntlhare, L.A. 2016. Challenges faced by foundation phase educators in the implementation of the life skills curriculum in teaching about HIV/AIDS and sexuality education in the primary schools in the Motheo District. Central University of Technology, Free State.
- Ramohapi, S. 2016. An investigation into factors that contribute to learners' poor performance in Mathematics: A case study of some selected secondary schools in the Motheo District. Central University of Technology, Free State.
- Teba-Teba, N.C. 2016. The influence of parental involvement in formal education at high schools in the Mphahlele District of Lesotho. Central University of Technology, Free State.
- Van Heerden, I. 2016. Three-dimensional Digital Geometry Design of Soft Tissue implants for patients with Poland's Syndrome using Magics and Freeform Modelling. Central University of Technology, Free State.

Completed Doctorate Degrees

- Khechane, N.C. 2016. Developing a model for assessment in primary schools in Maseru Lesotho. Central University of Technology, Free State.
- Makara, M.C. 2016. Improving teacher pedagogical practices through lesson study in secondary schools in Maseru Lesotho. Central University of Technology, Free State.
- Matheolane, R.M. 2016. The use of corporal punishment to manage learners discipline in Lesotho high schools. Central University of Technology, Free State.
- Thabane, R. W. 2016. Deconstructing teacher content and pedagogical knowledge in Mathematics & Science curricula in teacher education in South Africa. Central University of Technology, Free State.

List of conference proceedings

- Alexander, A. 2016. The Development of Guidelines for Management Teams in Facilitating Multicultural Education Initiatives in Integrated School Settings. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Alexander, G. and Mpisi, A. 2016. Proposing Guidelines for the Implementation of Multicultural Education Initiatives in Integrated Schools of South Africa. A paper presented at the Education and Development Conference 2016 5-7 March 2016 Bangkok Thailand.
- Alexander, G. and Roodt, M. 2016. Academic writing and writing for publication. Workshop facilitated at the 6th International Conference on Science and Social Science "Mutual Community Engagement Toward Global Understanding and Sustainable Well-being", 22-23 September, 2016, Rajabhat Maha Sarakham University, Maha Sarakham, Thailand.
- Badenhorst, J. 2016. Understanding Learning Styles and Preferences of Postgraduate Education Students. A paper presented at The International Academic Forum (IAFOR) International Conference on the Social Sciences – 27 – 29 February 2016, Dubai, United Arab Emirates.
- Badenhorst, J. 2016. Understanding learning styles and preferences of Postgraduate education students. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Beukes, J.A.G. 2016. Teacher Education and Emotional Intelligence: a literature review. A Paper presented at the ISEARCHED Conference, 2-3 December 2016 Palawan, Philippines.
- Beukes, J.A.G. and Setlalentoa, W. 2016. Emotional Intelligence (EI) Training for student teachers at the Central University of Technology Free State. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Cronje, J. 2016. Engagement in the Visual Arts: A Way to Negate Assertion Violence and Mass-Mediated Compassion Fatigue. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Dalton, E. J. H. 2016. Visual Arts as Context for Sustainable Cultural Heritage Preservation: A Case Study for the Integration of Digital Fabrication Technologies in Ceramics Practices. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Kalobo, L. 2016. Teachers' perceptions of learners' proficiency in statistical literacy, reasoning and thinking. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Lenong, B. 2016. Student Experiences of a First-Year Reading Development Course at a University of Technology, Free State. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Magumela, M. and Mhlolo, M.K. 2016. Teachers' Perceptions of Support Given by Subject Education Specialists: A Case Study of 3 Selected High Schools in the Maluti Education District. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Maimane, J.R. and Letuka, M. 2016. School-based learning coordination via e-Thuto: the good, the bad and the ugly! A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Maimane, J.R. and Timire, J. 2016. Education for Social Justice: Advocacy through the Scholarship of Teaching and Learning (SoTL) at a University of Technology in South Africa. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Maimane, J.R. and Timire, J. 2016. The application of the collaborative (team) approach in solving practical problems in Technology Education. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Makura A.H. 2016. Managing postgraduate supervision in South African Higher Education: reflections and possibilities. International Research Enthusiast Society Inc. ISEARCHED in conjunction with The Philippine International Studies Organisation, The Legend Hotel, Puerto Princesa City, Palawan, Philippines, 01-03 December.
- Makura, A.H. 2016. Managing teaching and learning in Postgraduate programmes in a University of Technology: Challenges and Prospects. A paper presented at the Education and Development Conference 2016 5-7 March 2016 Bangkok Thailand.

- Manduna, W. 2016. Empirical Study of DigitalPoverty: A Case Study of a University of Technology in South Africa. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Manduna, W. 2016. The use of social network sites (SNS) to enhance assignments writing by Information Technology Teacher training repeating students: An Information Communications Technology perspective. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Mangwegape, B. 2016. Considerations for the improvement of first year teacher education Students' reading ability in Setswana Home Language. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Mangwegape, B. 2016. Investigating the Speech Act of Apology in Setswana in South African Higher School Settings. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Masoabi, C. 2016. Developing learners' intrinsic motivation through the use of Student Teams Achievement Divisions (STAD) in Technology classrooms. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Masoabi, C. 2016. The Effects of Student Teams Achievement Divisions (STAD) as a Cooperative Learning Technique on Learners in Technology Classrooms. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Maswanganyi, F.T. and Nkoana, E.M. 2016. An Examination Of Factors Hindering The Growth Of Media Firms In Capricorn District Region Of Limpopo Province, South Africa. A paper presented at the International Conference on Public Administration and Development Alternatives (IPADA) 06-08 July 2016, The Park Hotel, Limpopo Province, South Africa.
- Matlho, T. 2016. Multigrade teaching and learning: A viable alternative. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Matlho, T. 2016. Envisaging an Ideal Multi-grade Classroom: From Social Injustice to a Sustainable Learning Environment. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Matoti, S. 2016. Student teachers' perceptions of their actual classroom environments and implications for teacher educators. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Matoti, S. and Lekhu, M. 2016. Promoting constructivist learning environment ideas or principles in chemistry. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Matoti, S.N. 2016. Academic self-efficacy and academic stress of first-year pre-service teachers. A paper presented at the International Journal of Arts & Sciences (IJAS) Conference 21 – 24 June 2016, Munich, Germany.
- Matoti, S.N. 2016. Instructional Leadership Efficacy of Secondary School Principals in the Free State Province of South Africa. A paper presented at the Education and Development Conference 2016 5-7 March 2016 Bangkok Thailand.
- Matoti, S.N. and Setlalentoa, W. 2016. Assessing pre-service students' perceptions of their constructivist classroom environment in Life sciences. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Mhlolo, M.K. 2016. Breathing new life into an old debate about the mathematically gifted child. A paper presented at the 22nd Annual National Congress of the Association for Mathematics Education of South Africa (AMESA) 27 June to 1 July 2016 Tshwane University of Technology, Mbombela Campus.
- Mhlolo, M.K. 2016. High school teachers' preparedness for the identification and nurturing of the mathematically gifted learners. A paper presented at the Education and Development Conference 2016 5-7 March 2016 Bangkok Thailand.
- Mhlolo, M.K. 2016. Inclusive education with the gifted students in mind: the extent to which teachers in the regular classrooms teach for creativity. A paper presented at the 8th International Conference on Learning, Education and Pedagogy (LEAP): Dec 17-23, 2016, Grand Hotel, Dubai, United Arab Emirates.
- Mhlolo, M.K. 2016. To what extent are our teacher-training programmes preparing teachers to differentiate their instruction for inclusivity? The case for gifted students. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Mhlolo, M.K. 2016. Using Discourse Theory to analyse mathematical giftedness within the South African Education System. A paper presented at the 13th International Congress on Mathematical Education (ICME) 24 – 31 July 2016, Hamburg Germany.

- Modise, A. 2016. An exploration into the difficulties by University students in integrating HIV/AIDS in South Africa. A paper presented at the SAERA Conference, 23 – 26 October, Stellenbosch University, Cape Town, South Africa.
- Modise, A. 2016. Limited English Proficiency Learners (LEP) Participation in Accounting Classroom in South Africa. A paper presented at the Southern African Society for Education (SASE) Conference, Richards Bay, University of Kwa-Zulu Natal, 28th – 30th September 2016
- Modise, A. and Schlebusch, G. 2016. Using Code-switching as a Strategy to LEP grade 10 Accounting Learners in South Africa. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Mohokare, D. & Mhlolo, M.K. 2016. Using differentiated instructional strategies in teaching gifted learners in high school. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Mokhothu, K.G. 2016. Integration of Civil Technology theory content: students' practical work perspective. Paper presented at the SAICET Conference held at Manhattan hotel, Pretoria 24-26 April 2016.
- Mokhothu, K.G. and Maimane, J.R. 2016. The Effectiveness of Demonstrational Method in Promoting Student Centred Method: a Case Study. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Mokhothu, K.G. and Rankhumise, M.P. 2016. The importance of teaching calculations in Civil Technology curriculum. Paper presented at SAICET Conference held at Manhattan hotel, Pretoria 24-26 April 2016.
- Moliko, R.Z. 2016. Critical Pedagogy as a means of enhancing effective teaching in a Multicultural Lecture room at Central University of Technology Free State. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Morolong, I. and Setlaltoea, W. 2016. Attrition among first year university of technology students: a study of first year Somatology and Human Resources Management students at the Central University of Technology, Bloemfontein (Work in Progress). A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Mpisi, A.S. and Alexander, G. 2016. Ascertaining the intricacies associated with the self-concept development of black learners in historically white schools. A paper presented at the 11th Annual Education and Development Conference, Bangkok, Thailand, 5-7 March 2016.
- Ndamani, L. 2016. The Leadership Efficacy of Secondary School Principals in the Free State Province of South Africa and its Effect on the School Climate. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Ngidi, D. 2016. Job Satisfaction, Organizational Commitment and Self-Esteem of Teachers in South Africa. A paper presented at the London International Conference in Education, November 14-17, 2016, London UK.
- Nkoana, E.M. and Maswanganyi, F.T. 2016. What Is In A Word? Implications of University-Community Engagement Connotations at Higher Education Institutions. A paper presented at the International Conference on Public Administration and Development Alternatives (IPADA) 06-08 July 2016, The Park Hotel, Limpopo Province, South Africa.
- Phindane, P. 2016. A comparative study of requests among second language speakers of English. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Roodt, M. 2016. Reflective Practice as an Integral Aspect of Teacher Education; A Case Study at a University of Technology. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Roodt, M. 2016. Using reflective journals in raising grammatical awareness amongst pre-service teacher education students. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Schlebusch, L. 2016. How to promote problem solving using computer applications. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Segalo, L. 2016. The proliferation of the teachers' right to discipline in South African public schools: Context and setting. A paper presented at the Southern African Society for Education (SASE) Conference, Richards Bay, University of Kwa-Zulu Natal, 28th – 30th September 2016

- Segalo, L. 2016. Student Teachers' Experiences of Learner Classroom Behavioural Challenges during Teaching Practice: A Case of BEd Third Year Students at a University of Technology in South Africa. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Setlalentoa W. 2016. Investigating Life Sciences student teacher's attitudes towards practical work. A paper presented at ISEARCHED Conference, held on 2-3 December, Palawan, Philippines
- Setlalentoa, W. 2016. Student teacher's conception on the use of formative assessment in the classroom. A paper presented at the Education and Development Conference 2016 5-7 March 2016 Bangkok Thailand.
- Setlalentoa, W. 2016. Science student teacher's perceptions of good teaching. A paper presented at the International Journal of Arts & Sciences (IJAS) Conference 21 – 24 June 2016, Munich, Germany.
- Timire, J. and Maimane, J.R.(2016. 'The application of collaborative (team) designing approach to solve practical problems in Technology Education.' A paper presented at SAICET conference held at Manhattan hotel, Pretoria 24-26 April, 2016
- Van Schalkwyk, F. 2016. Towards sustainable well-being through curricular community engagement: A South African perspective. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.
- Viljoen, W. Setlalentoa, W. 2016. Utilizing e-learning effectively in the training of student teachers in 3D CAD and 3D printing. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Zwane, M.G. 2016. Envisaging an Active Learning Approach for Economics Teacher Education students at a University of Technology. A paper presented at the SOTL Conference, 27 – 28 October, Bloemfontein, South Africa.
- Zwane, M.G. 2016. How prepared is Our First Year Students? Challenges Faced by Lecturers at a University of Technology. A Paper presented at the International Conference on Science and Social Sciences, 22-23 September 2016 Rajabhat Maha Sarakham University (RMU), Thailand.

List of Journals/Articles (DHET subsidised)

- Alexander, G. 2016. Reflections on the State of Multicultural Education in Historically White South African Schools. *International Journal of Educational Sciences*, 13(1): 118-128
- Badenhorst, J.W. and Van der Merwe, M.M. 2016. Trial and Error? An Inquiry into Implementing a 'Straight-for-English' Approach with Foundation Phase Students with Inadequate English Proficiency. *Journal of Asian and African Studies*, 1 – 17.
- Gobingca, Z. and Makura, A.H. 2016. Managing Instructional Challenges: Strategies Employed By Teachers in Supporting Multilingual Primary School Learners in South Africa. *DIRASAT, Educational Sciences*, 43(2): 735 -745.
- Kalobo, L. 2016. Teachers' Perceptions of Learners' Proficiency in Statistical Literacy, Reasoning and Thinking. *African Journal of Research in Mathematics, Science and Technology Education*, 2016 <http://dx.doi.org/10.1080/18117295.2016.1215965>.
- Lekhu, M. 2016. Physical Science Teachers' Self-Efficacy Beliefs on Conducting Laboratory Experiments. *International Journal of Educational Sciences*, 14(1, 2): 102-109.
- Maimane, J.R. 2016. The Impact of Student Support Services on Students enrolled for National Certificate Vocational in Motheo District, Free State, South Africa. *Universal Journal of Educational Research*, Vol. 4(7): 1680-1686,
- Mabusela, S.M., Ngidi, D.P. and Imenda, S.N. 2016. Implementing the National Curriculum Statement in the Further Education and Training Band: Educator's Experiences in South Africa. *Journal of Social Sciences*, 46(1): 61-70.
- Makura A.H. 2016. The glorification of patriarchy through sound in Paul Matavire's music lyrics. *Muziki Journal*, 3(2): 3-19.
- Manduna, W. 2016. Social media (SM) use by technology education students on field placement, *Journal of Psychology in Africa*, 26(2): 186-188.
- Manduna, W.M. 2016. Evaluating the Effectiveness of Student Instructors (SI) at a South African University. *International Journal of Educational Sciences*, 13(3): 335-341.
- Manduna, W. 2016. Empirical Study of Digital Poverty: A Case Study of a University of Technology in South Africa. *Journal of Communication*, 7(2): 317-323 (2016)

- Matoti, S.N. and Lekhu, M.A. 2016. Sources of anxiety among pre-service teachers on field placement experience. *Journal of Psychology in Africa*, 26 (3): 304-307.
- Meda, L. 2016. A Journey without Planned Destination: Traumatic Transmigration Experiences of Refugee Children. *Journal of International Migration and Integration*. DOI 10.1007/s12134-016-0477-x.
- Meda, L. and Makura A.H. 2016. Adolescent Girls' perceptions about HIV and AIDS related risky behaviours: are we closer to combating the pandemic among South Africa's youths? *Commonwealth Youth and Development Journal*, 14 (2): 71-80.
- Mhlolo, M.K. 2016. Students' Dichotomous Experiences of the Illuminating and Illusionary Nature of Pattern Recognition in Mathematics, *African Journal of Research in Mathematics, Science and Technology Education*, 20:1, 45-56, DOI: 10.1080/10288457.2016.1145446
- Mhlolo, M.K. 2016. Regular classroom teachers' recognition and support of the creative potential of mildly gifted mathematics learners. *ZDM Mathematics Education*, DOI 10.1007/s11858-016-0824-6.
- Mushori, S. and Chikobvu, D. 2016. Stochastic mean absolute deviation model with random transaction costs: securities from the Johannesburg stock market. *International Journal Operational Research*, 26(2): 127 – 152.
- Phindane, P. 2016. Issues of Ambiguity in Sesotho: Meaning Retrieval, *Journal of Social Sciences*, 47(2): 104-110.
- Rankhumise, M. P. 2016. Alleviating Alternative Conceptions and Conceptual Difficulties of Energy in Grade 10 Mechanics Using Contextual-Conceptual-Formal Understanding. *DIRASAT, Educational Sciences*, 43 (1): 361 – 374.
- Schlebusch, G. and Kgati M. 2016. Human Resource Development for Office-based Educators. *Journal of Social Sciences*, 47(2): 177-184.
- Schlebusch, G. and Mokhatle M. 2016. Strategic Planning as a Management Tool for School Principals in Rural Schools in the Motheo District. *International Journal of Educational Sciences* 13(3): 342-348.
- Setlaltoea, W. 2016. Science student teachers' perceptions of good teaching. *Journal of Teaching and Education*, 5(2), 473 – 480.
- Setlaltoea, W. 2016. Learners' Perceptions of the Teaching Effectiveness of Science Tutors during Winter School Sessions. *International Journal of Educational Science*, 15(3): 313-317.

Books and Book Chapters

- Makola, S. 2016. *Find Meaning Stop Wondering: Assisting youth to find meaning and achieve success in their studies*. Pretoria, UNISA Press. ISBN 978-1-86888-797-2





FACULTY OF MANAGEMENT SCIENCES

PART 8

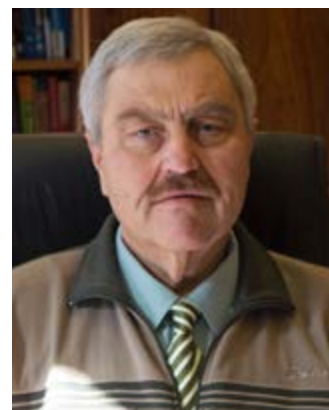


A message from the Dean - Prof. AJ Strydom

The Faculty of Management Sciences is fully committed to reach the targets set out in CUT's Research and Development Plan 2014-2020. The year 2016 was another good one for us! We experienced a growth of 15% in accredited journal publications for the period 2015-2016, while the growth in masters and doctoral degrees awarded was 120% and 125% respectively. This is indeed a significant performance and I want to thank all the colleagues who worked so diligently to reach these achievements!

Despite this, the Faculty still faces challenges in terms of broadening its research participation base, increasing the number of full-time post-graduate students, internationalisation in research and improvement in staff qualifications. We will continue to address these challenges in an attempt to position the Faculty as a role-player to reckon with in the global arena. One significant step in going forward, was to appoint an Assistant Dean: Research, Innovation and Engagement with effect from 1 January 2016 to accept primary responsibilities for the research portfolio.

We experienced a growth of 15% in accredited journal publications for the period 2015-2016, while the growth in masters and doctoral degrees awarded was 120% and 125% respectively. This is indeed a significant performance and I want to thank all the colleagues who worked so diligently to reach these achievements!



Prof. AJ Strydom
Dean – Faculty of
Management Science

A message from the Assistant Dean: RIE

Research development continues to grow in the faculty and we consider 2016 a year of remarkable achievements. As staff participation in student supervision and co-supervision increases in the faculty as witnessed in 2016, the faculty produced nine [9] doctoral and eleven [11] masters graduates. Of these, three doctoral and three masters graduates were staff members in the faculty. Well done colleagues!

The faculty strategy of supporting staff for conference attendance, national and international, which clearly differentiates staff at different levels of growth in terms of research, has been helpful in ensuring that there are more publication credit units than the number of conferences attendance as we witnessed in 2016. There were 20.55 credit units [out of a target of 25], against five papers read at international conference. In the same vein, it is interesting to note the steady increase in the number of our novice researchers attending national conference to gain the necessary research, networking and presentation experiences. The majority [55%] of the staff members who attended national conferences were from the Welkom campus, an indication of the uptake of research as an integral part of their academic work in the faculty.

Our postgraduate capacity building programme continues to grow yearly. In 2016, a total of three [3] workshops were held for staff and postgraduate students, focusing on proposal writing, language and academic writing, as well how to write a theoretical paper from a research proposal. Interesting to note is that the workshops yielded worth reporting results. Firstly, three postgraduate students [1 from Welkom] presented papers at national conferences, funded by Faculty Research and Innovation Committee [FRIC], in Durban and Cape Town, respectively. Secondly, eight theoretical papers were written by postgraduate students, and they were published in our university internal journal, the Interim for 2016. Congratulations

to the students, Dr P. Rambe, our Senior Researcher, as well as the editorial board that helped in reviewing the papers: Professor T. Van Niekerk, Professor D. Kokt, Mrs L. Steenkamp and myself.

Unlike the previous years, external funding applications, especially NRF funding received positive attitude[s] from staff. As a result, three staff members were awarded the NRF KIC funding in 2016, to the tune of R85000.00, plus one staff member successfully applied to NRF for a student intern under the DST Internship Programmes. The KIC grants were used to continue implementing our internationalisation strategy of increasing regional and African partners. Two partnerships with two African universities were created, that is, Ho University of Technology in Ghana, and Great Zimbabwe University in Zimbabwe.

We continue to support staff in achieving higher qualifications. As of December 2016, four staff members were registered for masters studies while ten were registered for a doctorate degree. As of the same period, the faculty had supported a total number 33 staff with DHET funding for their studies. The spending of the allocated funds has however, not been that satisfactory. Two staff members had their sabbatical leave applications to complete their doctoral studies approved by URIC on 21 October 2016. The effective date for their leave is July 2017.

Key research and development challenges that the faculty has to pay attention to include staff capacity for statistical analysis, increase in staff who supervise students, since the number of postgraduate students in the faculty continues to increase every year.



Prof. Chipunza
Assistant Dean:

Research Innovation and Engagement





Research Seminars

In addition to the workshops held for staff and students in 2016, the faculty continues to take pride in hosting its Annual Prestige Research Seminar. The 2016 Prestige Seminar was graced by our guest Speaker, Professor Pillay, from the University of KwaZulu Natal [UKZN].

The following research initiatives were undertaken:

Maccauvlei 3rd Stream Project - Intakes 7 & 8

A need for continued skills development specifically for HR practitioners was expressed by a myriad of sectors within the South African economy. CUT's B.Tech: HR was deemed most appropriate to fulfil this need. Through an RPL process, most HR practitioners within the middle to senior management level were found to qualify for admission into this prestigious and much sought after programme.

The Department of Business Management's flagship project namely, Maccauvlei third-stream project continue to make a significant impact on one of the national imperatives, namely, increasing the skills base across sectors of the economy. In its seventh intake, Maccauvlei attracted a maximum of 55 delegates from a total of 102 applications for its B.Tech: HR programme, all HR practitioners within the respective companies, while intake 8 attracted a total of 56 delegates from a total of 106 applications. So far just over 500 delegates successfully graduated with this qualification.

Project Management Project

Project Management Project, a popular programme in the Management Faculty, attracts students from various corners of South Africa as far as Limpopo, Mpumalanga Eastern Cape and North West provinces. International students from Lesotho [The LIPAM Group], Zimbabwe Nigeria and Ghana demand admission into the programme. The B Tech Project Management offers industry-related courses in the areas such as Project Management Process, Strategic Management, Entrepreneurship, Operational Research, Project Quality Management among others.

The over-arching aim of the B Tech Project Management programme is to inculcate in the project management graduates project management principles, philosophies and practices to enable them manage projects by applying project management tools and techniques holistically for to achieve quality project outcomes for the ultimate satisfaction of their customers.

The B. Tech Project Management Programme is run over two years. The course modules are semesterised whereby students write semester assessments in the various learning areas. At the end of the 2nd year, successful students are awarded the B. Tech Project Management degree. Successful candidates in 2016 graduated in March 2017 where they were awarded their degrees. New projects negotiated for in 2016 but offered in 2017 included the SSETA Project, which will be run over 6 provinces in the country.



Completed Master's Degrees

- De Assis Antonio, Muir, F. 2016. "The expectations and experiences of South African leisure tourists visiting Mozambique". Central University of Technology, Free State.
- Etzebeth, T.J. 2016. "The development and evaluation of a training programme to ensure effective motor vehicle accident and claims administration in the South African National Defence Force". Central University of Technology, Free State.
- Makhoali, K.J. 2016. "Impact of selected demographic variables on the sustainability of the Small, Medium and Micro Enterprises (SMMEs) in selected communities of Matjhabeng in Welkom". Central University of Technology, Free State.
- Mangope, D.F. 2016. "The sustainability of financial investment in community-based tourism projects in the Thabo Mofutsanyana District of the Free State Province". Central University of Technology, Free State.
- Matsumunyane, L.L. 2016. "The relationship between motivational sources and leadership styles among middle managers at a South African University." Central University of Technology, Free State.
- Modise, D.L. 2016. "The relationship among self-leadership, locus of control and job performance of engineers in a power distribution utility, Eskom". Central University of Technology, Free State.
- Mokoena, I.G. 2016. South African vacation makeovers: evaluating medical cosmetic tourism in selected areas of South Africa.
- Mphirime, B.G. 2016. "The influence of corruption on physiological capital: The case of a large government department in the Motheo District, Free State Province". Central University of Technology, Free State.
- Mpholo, T.S. 2016. "The relationship between perceived religious discrimination and work-related attitudes, with specific reference to the Rastafari religion". Central University of Technology, Free State.
- Proos, E. 2016. Assessing the marketing and management effectiveness of the Free State region of the Maloti Drakensberg route
- Ramavhea, G. 2016. "An investigation of students' financial literacy at the Central University of Technology, Welkom campus. Central University of Technology, Free State.
- Sobayeni, N.C. 2016. "Work ethics and work values: A generational perspective". Central University of Technology, Free State.

Completed Doctorate Degrees

- Hattingh, J.L. 2016. "The Karoo Riviera: A cross border tourism development plan for the Middle Orange River". Central University of Technology, Free State.
- Hoeyl, P. 2016. "Validating the social responsibility of SMMEs in the African context; A comparative analysis of SMMEs in Ghana and South Africa". Central University of Technology, Free State.
- Jacobs, H.S. 2016. "A strategy to optimise the contribution on Work-Integrated Learning towards the employability of students of the Central University of Technology". Central University of Technology, Free State.
- Malan, S.F. 2016. "An Integrated framework for the development of the music industry in the Northern Cape Province". Central University of Technology, Free State.

Murenzi, P. 2016. "A comparative study on the utilisation of e-government by selected municipalities on South Africa and Rwanda: Development of a model for effective and efficient online service delivery". Central University of Technology, Free State.

Okyere, F. 2016. "Comparative analysis of environmental issues as a social responsibility concern for selected SMMEs in two African countries: South Africa and Lesotho". Central University of Technology, Free State.

Oosthuizen, A.J. 2016. "Managing the household of God: A study on the managerial principles and skills needed in the effective and efficient management of the church as an organisation". Central University of Technology, Free State.

Ramorena, M.G. 2016. "The impact of social networks on innovation, competitiveness and firm performance in the South African context: A case study of emerging construction firms in the Free State". Central University of Technology, Free State.

Sebolao, R.R. 2016. "Integrating indigenous knowledge of selected rural areas of the Northern Cape into Department Project Management". Central University of Technology, Free State.

Papers/posters presented at International Conferences

Haarhoff, R. 2016. Investigating international airline price competitiveness: a case study of ICOT 2016 International Conference of Tourism, Naples, Italy, 28 - 02 July 2016.

Haarhoff, R. 2016. Competitive airfares as an enabling factor to sport event success: a South African case study. The 4th World Congress on Sport and Health Sciences (WCSHS2016), Barcelona, Spain.

Haarhoff, R. 2016. Investigating International price competitiveness: a case study of South African Airways. International Conference on Tourism 2016. Naples, Italy. (KIC Travel Grant).

Naong, M.N. 2016. Exploring the relationship between skills development transfer and organisational commitment – a case-study of Free State TVET Colleges. 25th International Academic Conference, OECD Headquarters, Paris, France.

Van Der Walt, F., Jonck, P. and De Lange, J.J. 2016. Exploring Retail Crime in A Business Sector of South Africa. 15th International Conference on Business, Economics, Social Science & Humanities (BESSH). 8-9 July, Dubai, UAE.

Papers/posters presented at National Conferences

De Jager, H.J., Mthembu, T.Z., Ngowi, A.B. and Chipunza, C. 2016. Towards an innovation and entrepreneurship ecosystem at a University of Technology: Implementation of a strategy to enhance socio-economic development. 9th Annual International SATN Conference, Blue Lagoon Hotel, Cape Town, 12-14 October 2016.

Hattingh J.L. 2016. The marketing and management effectiveness of the Free State section of the Maloti Drakensberg Tourism route. 1st TESA International Conference 21-23 September, Cape Town.

Kokt, D. 2016. An educational game to enhance entrepreneurial skills of tourism students and practitioners. 1st TESA Conference, hosted by CPUT (21-23 September 2016), Cape Town, South Africa.





Kokt, D. 2016. Best practice teaching and learning for a new generation student. Innovation in Teaching and Learning Conference, hosted by CUT (13-14 June 2016), Bloemfontein, South Africa.

Mlungwana, K. and Rambe, P. 2016. The Influence of Learning Orientation on the Sustainability of Community Radio Stations: A Theoretical view. Management, Business, Administration & Legal Initiatives (MBALI) International Conference. Richards Bay, South Africa. 6-8 July 2016.

Phalatsi, B.M.C., Chipunza, C. and Amoakoh, E. 2016. A comparative study of marketing communications of local and foreign national small grocery tuck-shop owners in Mangaung Metro. Management, Business, Administration & Legal Initiatives (MBALI) International Conference. Richards Bay, South Africa. 6-8 July 2016.

Ramphoma, S.S. 2016. An analysis of the effect of socio-economic factors on poverty in Nyakallong Township. Lamipisa Conference [5-7 September 2016], Cape Town, South Africa.

Ramphoma, S.S. 2016. The effect of grade 12 pass requirements and university admission requirements on the production of quality teachers. Lamipisa Conference [5-7 September 2016] Cape Town, South Africa.

Van Niekerk, T. 2016. Mechanisms to strengthen accountability and oversight within municipalities in the Free State Province. 15th International Winelands Conference, Stellenbosch, South Africa [29 March to 01 April 2016].

List of conference proceedings

Jonck, P. and Van Der Walt, F. 2016. Juxtaposing South Africa's Private Sector and Its Public Service Regarding Innovation Diffusion, to Explore the Obstacles to E-Governance. Proceedings from the World Academy of Science, Engineering and Technology. (249-255). Paris, France. E ISSN 1307-6892.

Mbeo, M. and Rambe, P. 2016. Assessing the feasibility of a knowledge management model for research knowledge retention at a university of technology. In: A. Strasheim, A. Nel and E. Koekemoer (Eds.). Proceedings of the 28th Annual Conference of the Southern African Institute of Management Scientists (pp. 606-616). 4 – 7 September 2016, University of Pretoria.

Mosweunyane, L. and Rambe, P. 2016. A Poverty Reduction Oriented Approach to Small Business Development in South Africa. In: I. Aaltio and M. T. Eskelinen (Eds.). Proceedings of the 11th European Conference on Innovation and Entrepreneurship (pp. 503-511), 15-16 September 2016, The JAMK University of Applied Science, Jyväskylä Finland.

Mpiti, N. and Rambe, P. 2016. The influence of public finance on the performance of SMMEs in the Free State: a case of afro hair salons in Mangaung Metropolitan Municipality. In: A. Strasheim, A. Nel and E. Koekemoer (Eds.). Proceedings of the 28th Annual Conference of the Southern African Institute of Management Scientists (436-449). 4 – 7 September 2016, University of Pretoria.

Rambe, P., Moeti, M. and Dzansi, D. 2016. A Stakeholder Approach to Advancing Business Social Responsibility of Small Tourism and Hospitality SMMEs in Bloemfontein, South Africa. In: I. Aaltio and M. T. Eskelinen (Eds.). Proceedings of the 11th European Conference on Innovation and Entrepreneurship (pp. 593-601), 15-16 September 2016, The JAMK University of Applied Science, Jyväskylä Finland.

Rambe, P., Ndofirepl, T. and Dzansi, D. 2016. Technological Creativity and its Influence on Entrepreneurship Intentions of Vocational Education Students. In: I. Aaltio and M. T. Eskelinen (Eds.). Proceedings of the 11th European Conference on Innovation and Entrepreneurship (pp. 602-610). 15-16 September 2016, The JAMK University of Applied Science, Jyväskylä Finland.

List of Journals/Articles (DHET subsidised)

Arko-Cobbah, A. and Olivier C.D. 2016. Promoting Sustainable Development in Africa: The Role of Civil Society and the Importance of Access to Information Regime. *African Journal of Public Administration and Management*, 45(2): 46-70.

Arko-Cobbah, A. and Olivier C.D. 2016. South African's access to information to legislation and Socio- Economic Rights: Civil society and meaningful engagement as drivers. *South African Journal of Information Studies*, 34(1): 149-172.

Bere, A. and Rambe, P. 2016. An empirical analysis of the determinants of mobile instant messaging appropriation in university learning *Journal of Computing in Higher Education*: DOI 10.1007/s12528-016-9112-2.

Chetty, M., Van Niekerk, T. and Olivier, C.D. 2016. The need for active debt management in financially challenged municipalities in the Free State Province. *ASSADPAM*, 24(1).

De Villiers, C. 2016. Exploring key considerations when determining bona fide inadvertent errors resulting in understatements, *Journal of Governance and Regulation*, 5 (1): 50 -60.

Dzansi, L. 2016. A South African study of the influence of fairness of human resource management practices on service quality. *The Journal of Applied Business Research* – 32(3): 871-882.

Dzansi, L.W, Chipunza, C. and Monnapula - Mapesela, M. 2016. Municipal employees' perceptions of political interference in human resource management practices: Evidence from the Free State Province in South Africa. *International Business & Economics Research Journal*, 15(1): 15-26.

Dzansi, LW., Chipunza, C. and Dzansi, D.Y. (2016). Impact of municipal employees' perceptions of fairness in human resources management practices on motivation: evidence from a South African Province. *Problems and Perspectives in Management*, 14(1), 138-149.

Grobbelaar, C. and Alsemgeest, L. 2016. The relationship between spousal communication and financial arguments and stress between young married couples. *Journal of Social Sciences*, 46(3), March 2016.

Jonck, P., Van Der Walt, F. and Sobayeni, N.C. 2016. A generational perspective on values in a South African sample. *South African Journal of Industrial Psychology*, ISSN: (Online) 2071-0763.

Mokoena, L.G. and Haarhoff, R. 2016. Medical tourism: investigating the tourism potential of the medical cosmetic market. *African Journal of Hospitality, Tourism and Leisure*, 5 (4):1-16.

Naong, T. 2016. The moderating effect of skills development transfer on organizational commitment - a case-study of Free State TVET colleges. *Problems and Perspectives in Management*, 14(2): 28-38.

Olivier, C.D. 2016. The complexity of budget Reform and Performance Management in the South African Public Sector Financial Environment. *Association of Southern African Schools and departments of Public Administration and Management (ASSADPAM)*, 45(4): 46-70.





Oosthuizen, A.J. and Lategan, L.O.K. 2016. Strategic management of the church as challenge and reality. *Journal for Christian Scholarship*, 4th Quarter, 277-279.

Rambe, P. 2016. The Role of Educational Technology in Design and Delivery of Curricula Programs: A Case of STEPS at a University of Technology. *The African Journal of Information Systems*, 8(2): 86-113.

Rambe, P. and Dzansi, D.Y. 2016. Informal distributed leadership in technology adoption, *African Journal of Science, Technology, Innovation and Development*. 8(2), 155-165.

Rambe, P. and Mangara T. 2016. Influence of integrated reporting ratings, CEO age, and years of experience on the share price of top 106 JSE listed companies. *Problems and Perspectives and Management*, 14(3): 80-95.

Rambe, P. and Modise, D.L. 2016. Power distribution at Eskom: Putting self-leadership, locus of control and job performance of engineers in context. *African Journal of Business and Economic Research*, 11(1): 45-92.

Rambe, P. and Mokgosi, B. 2016. The Influence of personal, family and social variables on technology-oriented venture creation: Theoretical case of Internet Cafés in Bloemfontein, South Africa. *The Journal of Applied Business Research*. 32(4): 1063-1078.

Van De Walt E.S., Hattingh, Z. and Moolma, H.J. 2016. The impact of academic variables on the study experience of second year Hospitality Management students at selected South African Higher Education Institution. *African Journal of Hospitality, Tourism and Leisure*, 5(1): 1-18.

Van Der Walt F., Thasi, M.E., Jonck, P. and Chipunza, C. 2016. Skills shortages and job satisfaction – Insights from the Gold-Mining sector of South Africa. *African Journal of Business and Economic Research* 11(1):141-181.

Van Der Walt, F. 2016. Self-harming behavior among university students: A South African case study. *Journal of Psychology in Africa*, 25 (6): 508 – 512.

Van Der Walt, F. and Sobayeni, N.C. 2016. Work ethics of different generational cohorts in South Africa. *African Journal of Business Ethics*, 10(1): 52-66.

Van Der Walt, F., Mpholo, T.S. and Jonck, P. 2016. Perceived religious discrimination as a predictor of work engagement, with specific reference to the Rastafari religion. *Verbum et Ecclesia*, 37(1), a1524. <http://dx.doi.org/10.4102/ve.v37i1.1524>.

Books

Kokt, D. (2016). Organising (Chapter 5), Managing change in tourism and hospitality organisations (Chapter 6) and Motivation (Chapter 11). In: Hermann, U.P & du Plessis, L. *An introduction to tourism and hospitality management*. Pretoria, Van Schaik.

Reports from Research Professors - Visiting Professors

Professor Ulrich Holzbour, Aalen University, Germany

Below is activities and achievements as visiting Professor, Faculty of Management Sciences, Central University of Technology for 2016:

Holzbour, U., Strydom, A.J. , Agbobli, E. and Koko, D. 2016. Development and evaluation of an entrepreneurial game and compilation of a training manual.

Holzbour, U. and Lategan, L.O.K. Research management Book: to be published in 2017

Holzbour, U. and Haarhof, R. 2016. Sustainable tourism and sustainable event management Publication: to be published in 2017.

Holzbour, U. and Crowther, D. 2016. Educational aspects of student's activities – the festa del vinho as an educational project.

Publications:

Holzbour, U. 2016. VAL-U: Development of an Educational Game for Entrepreneurship and Sustainability in and for Developing Countries in: Schwägle et al. (eds) Planspiele – Vernetzung gestalten. ZMS-Schriftenreihe Bd 8, BoD Norderstedt . p. 95 – 109.

Holzbour, U. 2016. An Educational Game for Entrepreneurship and Sustainability. Journal of Business and Economics, ISSN 2155-7950, USA, June 2016, 7(6): 897-907, <http://dx.doi.org/10.2139/ssrn.2724080>.

Koko, D., Agbobli, R., Holzbour, U. 2016. Entrepreneurial game VAL-U Training Manual. CUT internal document.

Professor Lubbe, University of Free State

Below is activities and achievements as visiting Professor at the Department of Accounting at the Central University of Technology for 2016:

Presented a number of presentations on "research" from an Accountancy perspective for lecturers as postgraduate students.

Assist lecturers (and study leaders and postgraduate students) on:

Finding topics for masters/doctoral studies.

Preparing research proposals.

Finding study leaders.

Monitoring research progress.

Assisting with conference presentations.

Assisting with accredited and professional journal articles. Fostering Strategic partnerships (a summary of faculties' strategic partnerships)





**RESEARCH
IN TECHNOLOGY
AND INNOVATION**

PART 9

Centre for Rapid Prototyping and Manufacturing (CRPM)

The Centre for Rapid Prototyping and Manufacturing (CRPM) had a satisfactory 2016 and exceeded its target. There was a downturn in the South African economy, especially in the manufacturing sector, which affected the growth in the Centre's turnover. On the positive side, we have noted an increase in enquiries for medical implants.

The value of the 555 projects completed at the CRPM during 2016 was R 4 703 500, which was an increase of 10.8% compared to 2015. Approximately 10 700 parts were manufactured for the 555 industrial and research projects. Furthermore, a total of R 439 880 was spent on 52 research projects compared to R 572 860 which was spent on research projects during 2015.

Figure 1 below depicts the actual monetary monthly values compared to the targetted amounts.

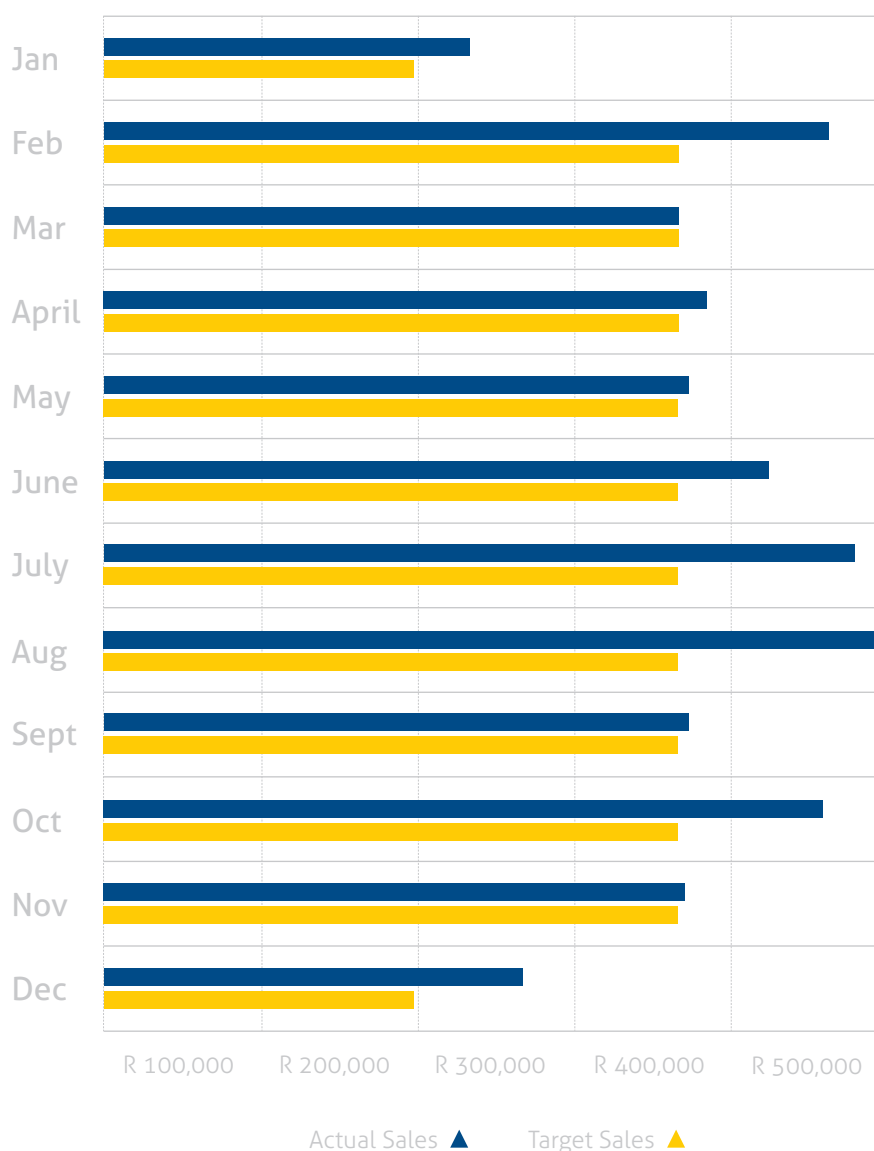


Figure 1: Monthly values of industrial projects: Actual vs Target

Highlights of the year

Life Health Care Group

The CRPM was invited to make a presentation to the Group Executive: Information Management Anton van Loggerenberg and R&D: Researcher Siphamandla Masuku to showcase the capabilities CRPM have in design and manufacturing of 3D printed implants and devices. Life Health Care Group (LHCG) is looking for local implant manufacturers for their 56 national hospitals which use innovative manufacturing technologies that can give them a competitive edge over their opposition. They are looking for innovative ways in reducing theater and patient recovery time and it is believed that Additive Manufacturing could play a very important role in achieving this. This presentation was done by Gerrie Booysen and Dr Cules van den Heever. Further discussions took place between CUT management and LHCG executives in order to finalise a Memorandum of Understanding.

Regional collaboration between Central University of Technology, Free State (CUT) and the University of the Free State (UFS) has brought new hope to heart disease patients in Africa. CUT and UFS are embarking on the new collaboration that will provide and advance universal access to surgical cardiac services; mainly in Africa and the world in general. A team from the two universities has developed a new polyurethane heart valve that will help treat rheumatic valvular disease- a disease that continues to affect over two million people in the Sub-Saharan region, China and Latin America.

"This is the beginning of an exciting phase of collaborative development between the UFS, CUT and Stellenbosch University, said Prof. Francis Smith, Head of Robert W M Frater Cardiovascular Research Centre in the Department of Cardiothoracic Surgery at UFS.

For years, doctors across the continent have been battling to come up with solutions for younger patients requiring heart valve replacement with a choice between a mechanical valve (requiring lifelong anticoagulation therapy) and a biological valve (not requiring anticoagulation).

This polyurethane valve is a new innovation in the medical field and was made possible by the University's School of Medicine. The valve does not require anticoagulation and might be an ideal solution for the young African patient.

"Our five-year plan is to deliver a service to our community through manufacturing of implantable patient-specific prostheses as requested by medical practitioners," said Mr Gerrie Booysen, Director of the Centre for the Centre for Rapid Prototyping and Manufacturing (CRPM) at CUT.

The valve has a titanium frame (which is 3-D printed by the CRPM) and then dips moulded using locally designed moulds and an automated dip moulding process developed at CUT. This project was initiated by Prof. Francis Smit in collaboration with the CRPM at CUT, which specialises in Additive Manufacturing, while the Mechanical Engineering Department at the University of Stellenbosch will be focusing on computational fluid dynamics and finite element modelling. The team will soon proceed with further benchmark testing required for FDA and CE mark registration, including strength testing and ultra-structure evaluation of the polyurethane leaflets. "Using sophisticated pulse duplication and fatigue testing, valve design can be evaluated and modified before final testing in our large animal unit. " The UFS and CUT have received funding from Technology Innovation Agency (TIA) to support this development. The 3D printed titanium valve, which is displayed during the press conference, represents a new innovation that will change the face of medical technology, not only in South Africa, but globally as well.



ISO 13485 Certification

CRPM has recently been certified for ISO 13485: medical devices and is the first university in Africa to receive this certification for 3D printing. The external international audit was conducted by TUV SUD Germany from 23 to 26 February 2016. The CRPM has been preparing for this audit for the last two years and was supported financially for the first year by the Technology Innovation Agency (TIA).

This is a quality management system which is only granted after a rigorous audit of all processes. This means that the products produced at the centre conform to the International Standards and accreditation. This will open the doors for commercial manufacturing of medical devices here in South Africa and also offer global export opportunities

The Carl & Emily Fuchs Foundation

In an endeavour to continuously improve quality of life, CRPM applied for funding from the foundation. The main objective is to assist patients in cases where tumours are removed and no reconstruction is done.

In August 2016 we were ecstatic to receive a notification informing our application for funding was successful. The grant has been approved for the amount of R 2 250 000 which will be rolled out over a period of 4 years. The foundation has fulfilled its obligation of releasing 2 tranches to the amount of R 400 000 for 2016 financial year.



Planning model



3D printed titanium implant after post processing

Case Study

This patient presented with a myxoma of the Midface: A maxillary frame implant was designed and manufactured by CRPM in titanium in order to restore facial profile and symmetry. The Carl & Emily Fuchs foundation funded the prosthesis development. An obturator and dental bar will restore mastication and speech functionality. This operation took place at Kimberley Hospital Complex and the surgeons were Drs Kobus and Werner Hoek, Dr Cules van den Heever and Dr Cornelius Borstlap. The operation was very successful and the patient had a follow-up consultation 3 weeks after the operation. The patient is in high spirits and is able to swallow and has started to speak.





Teaching And Research

Accredited Papers

Du Plessis, A., Le Roux, S.G., Booysen, G. and Els, J. 2016. Directionality of Cavities and Porosity Formation in Powder-Bed Laser Additive Manufacturing of Metal Components Investigated Using X-Ray Tomography". 3D Printing and Additive Manufacturing Journal. 3(1).

Fernandes N., Van den Heever, J., Hoogendijk C., Botha, S., Booysen G. and Els J. 2016. Reconstruction of an Extensive Midfacial Defect Using Additive Manufacturing Techniques. Journal of Prosthodontics 00 (2016) 1–6 2016

Van As, B., De Beer, D., Combrinck, J., Booysen, G. and La Grange, J. 2016. Direct metal laser sintering, utilising conformal cooling, for high volume production tooling. South African Journal of Industrial Engineering, 2016

Presentations at Conferences

Booyesen, G.J., Van der Merwe, A., De Beer, D., Van den Heever, C. and Els, J. 2016. Developing a patient-specific maxillary implant using Additive Manufacturing and Design. COMA 2016, International Conference on Competitive Manufacturing.

Du Preez, W.B., Booysen, G.J. and Möller, H. 2016. Growing Aluminium Demand through 3D Printing. AFSA International Aluminium Conference & Exhibition, 16 - 18 March 2016, Cape Town.

Van der Merwe,A., Booysen, G.J., De Beer,D., Van den Heever, C. Els, J. 2016. Additive Manufacturing for Cranio Maxillary Facial reconstruction. 2nd SU Biomedical Engineering Conference 2016.

External funding received

CRPM was successful in an application to The Carl and Emily Fuchs Foundation, and received the sum of R400000 of the R 2 250000.



Conclusion

CRPM is still playing a vital role in the industry although it is currently faced with a challenge of funding new projects due to an increasing amount of patients that need assistance. Notwithstanding the above mentioned challenge, we are making a remarkable progress in building relationships with strategic partners who will positively advance our vision of changing lives. We intend to utilise all our tools and capabilities in the current financial year to further ensure that CRPM stays the world renowned centre.

Product Development Technology Station (PDTs)

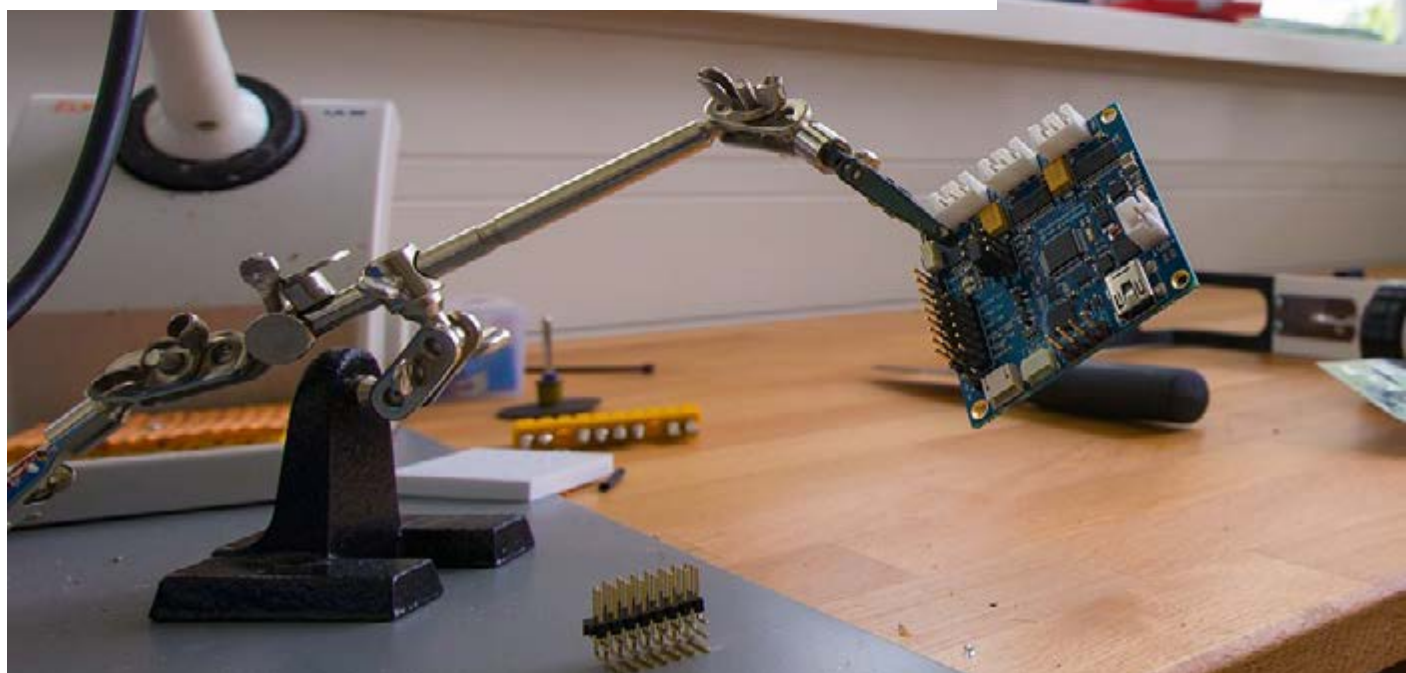
Since the annual financial and reporting cycle of PDTs runs from April every year to March the next year, this report is for the period 1 April 2016 to 31 December 2016 with some input on the period up to February 2017

PDTs is currently running smoothly and the targets for the quarter have been reached. There was a constant flow of new clients visiting the technology station regarding their product ideas throughout the quarter and assistance was offered to SMEs and individuals. The new Director: PDTs has not been appointed and this has an effect on other positions that need to be filled and an increase in the workload on all PDTs personnel. The CUT decided to revisit the reporting structures linked to Technology and Innovation subsequent to the retirement of the Director: Technology and Innovation. The PDTs was also reporting to the Director: T&I and the outcome of the repositioning is expected during April 2017.

Mr. Allan Kinnear was appointed as acting Project Engineer: PDTs due to his extra work and responsibilities. Mr. Tebogo Likhi was promoted to Junior Engineer: PDTs due to his excellent work on projects over the past few years. Mr. Eric Newby was appointed on a contract basis to assist with projects until the end of March 2017.

The PDTs is implementing a new project cost management system to ensure that the station project costs estimates are correct. This is also to assist with the full cost model of projects. The data gathered will assist the PDTs to be self-sufficient if TIA funding is stopped or the funding is changed.

The PDTs is also investigating the possibility of opening a Medical Assistive Device Accelerator to assist with Medical Assistive Device Product Development.



Human Resource Development

Staff Development

Mr Steven Ntoahae attended the NOSA SAMTRAC course from 21 to 25 November 2016 and on 27 February 2017 he had to re-write the theoretical exam. From 27 February 2017 to 01March2017, Mr Allan Kinnear and Mr Lambert Potgieter attended a wire cutting operator course which was presented by Mr. Steven Andrews of the EDM Shop

Personnel

No personnel changes or movements took place during the first quarter. Mr M Potgieter has been acting as director until a new director is appointed.

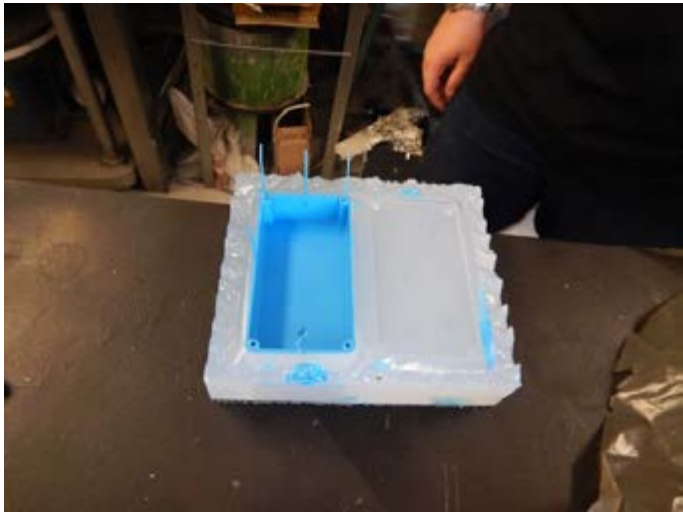
Interns

Every semester a new group of experiential training students are appointed. They all undergo ongoing training to better their skills and to increase their potential of being offered employment when they leave the PDTS to work in industry. Candidates for the intern programme are drawn from the pool of students completing their experiential training. If there is no funding available, some of the students have to work without remuneration to complete their experiential training in order to receive their qualification. This is not the ideal situation, but in the current financial climate, it is the only way to help the students. As interns in the programme perform a vital role in the PDTS, it is very important to train the students and transfer technology to them as they are the building blocks on which the future PDTS and industry will be built.

The Technology Station interns are highly sought-after by the Department of Mechanical Engineering and Mechatronics as well as industry.

Training at PDTS

All courses presented by PDTS are offered to industry, however, not many employees from industry have attended the courses as most companies cannot afford to have their personnel out of the workplace for such a long period of time. A vacuum casting course was held for the P2 students at the PDTS. Eight candidates attended the course.



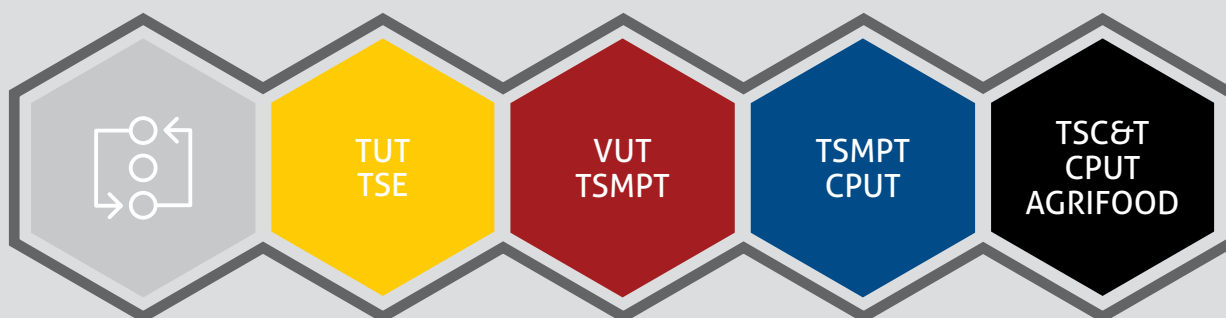
Marketing

The PDTS exhibited or took part in the following events:

MONTH	ACTIVITY
February	South African PhD Project Exhibition, President Hotel - 25 February 2016
March	Propak , Nasrec, Johannesburg - 15 - 18 March 2016
April	Open day at CUT, 8 April 2016
May	CUT Career Day, 7 May 2016
	OTASA Exhibition, 31 May 2016
June	Transnet YECE 2016, 2-3 June 2016, Civic Theatre, Bloemfontein
July	2 ND Government Open Day Expo, Botshabelo. By invitation of TIA, 21 July, 2016
October	ENT/SASLHA/SAAA Congress 2016, Sandton Convention Centre. 8-10 October 2016
November	RAPDASA, VUT, 2 – 4 November 2016

Institutional Learning and Development

During this year, PDTS interacted with the following technology stations:



Equipment usage

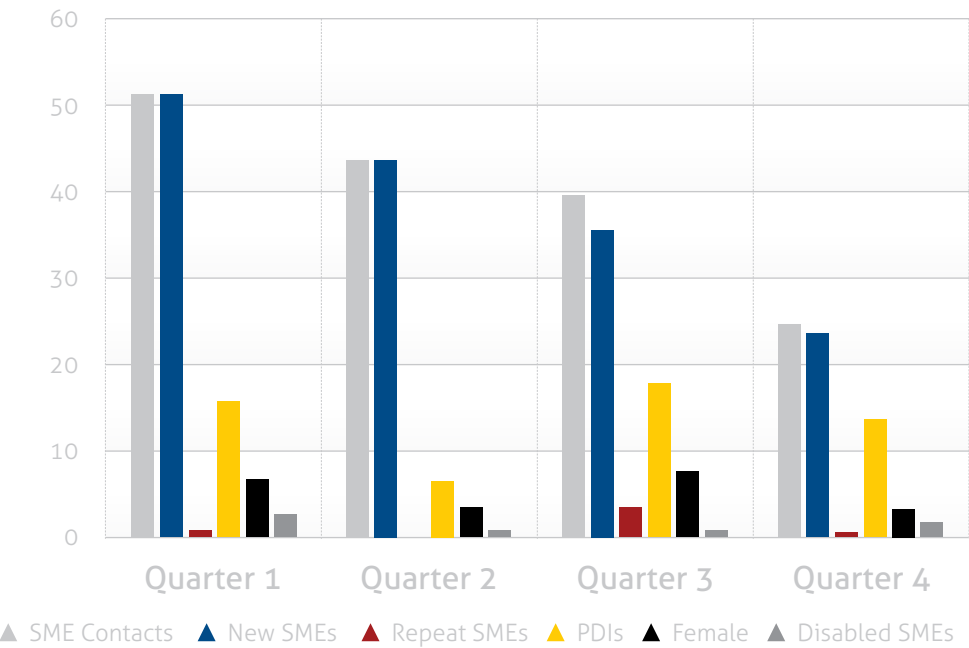
The new turn mill machine was delivered in January 2017 and must still be commissioned by WD Hearn. It was decided to refurbish the AccuteX EDM wire cutter. This was done by the EDM shop to enable consistency in the process to the PDTS. The Volksie shop electrical supply will be completed during March 2017. This will enable the PDTS to complete the move of SAMTI interns and equipment to the facility.



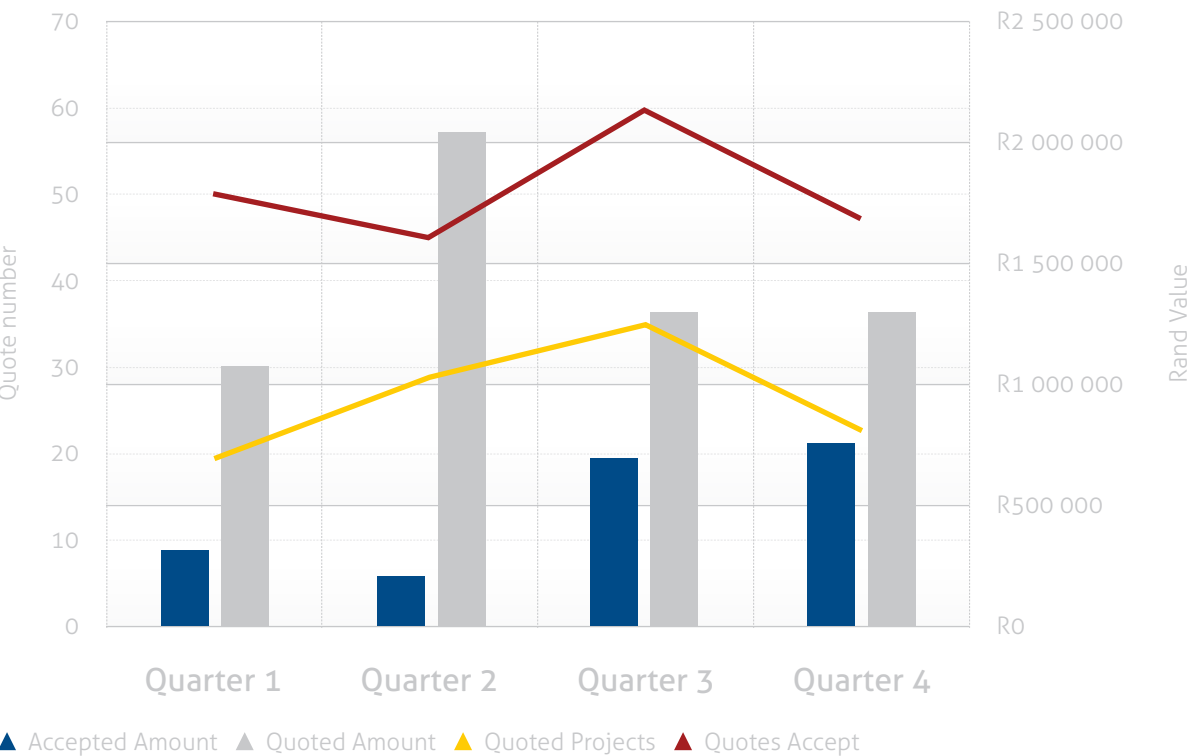
Economic value added

The PDTs had 180 SME enquiries requesting assistance compared to 187 in the previous year. An increase in the number of PDI enquiries has been noted.

SMEs seen during Q1-4 FY16/17



FY 2016/2017



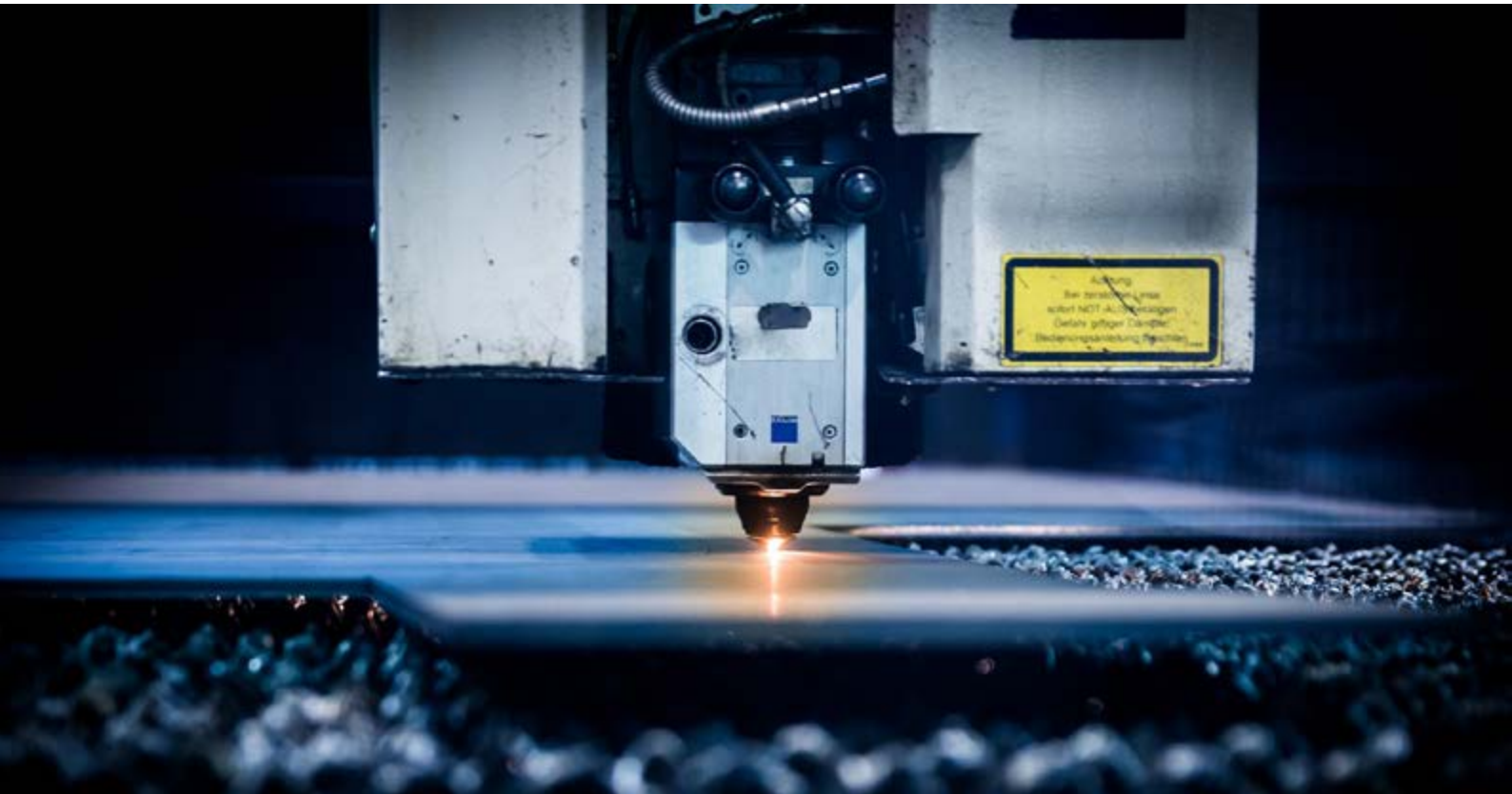
Governance and Management

A PDTS Management Meeting was held every quarter and the minutes were submitted to TIA. The PDTS director's position has not yet been filled and Mr Marinus Potgieter is still acting as director. A PDTS Advisory Committee Meeting was held on 17 January 2017

PDTS still plays a vital role in the Free State in supporting SMEs and individuals to develop their ideas into products. The station is trying to make a bigger impact by introducing

different strategies to better the service deliveries. The position of the Director: PDTS has not been filled. Contract personnel were appointed to alleviate the workload at the station. The receptionist position at PDTS/CRPM was advertised internal as the current one has expired. The management intend to merge the responsibilities of Ms Jenny van Rensburg with that of the newly appointed receptionist as her contract lapsed on 31 December 2016.





The CUT Fablab

The CUT Fablab was officially opened on 23 October 2006. Since DST decided to terminate the national FabLab programme, CUT finances this entity as from April 2014.

The Fablab receives large a number of users in a seasonal manner, depending on the academic calendar and due dates for the completion of academic projects. The next table shows a typical distribution of FabLab users:

A new trend has been started in Fablab on Fridays, trying to determine who can build the best LEGO robot. This is similar to the concept started called "code camp". The process literally makes building a sophisticated robot child's play. Our youngest user Palesa Modusi already put her own obstacle avoidance robot together, and with minor assistance, it turned out very impressive. It is fun to see how LEGO (which has been around for more than a hundred years) draws young minds to technology and at the same time makes learning fun.

Similarly, Arduino systems are becoming increasingly popular for the manufacture and programming of basic robotic control systems. This links up perfectly with students' educational experience in electronic engineering.

15%
School
Learners

70%
CUT
Students

10%
UFS
Students

5%
Private
Individuals/
Entrepreneurs





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