Contents

Message from the Rector - Prof T Tjivikua 5

Introductory Remarks by the Vice Rector: Academic Affairs and Research - Dr A Niikondo 7

Polytechnic of Namibia’s new Research Strategy 9

School of Economics and Finance 11
School of Engineering 13
School of Health and Applied Sciences 17
School of Humanities 23
School of Information Technology 25
School of Management 31
School of Natural Resources and Tourism 33

Centre for Cooperative Education 39
Namibian-German Centre for Logistics 41
Renewable Energy and Energy Efficiency Institute 45

Project Services Centre 49

Future Trends 53

Conclusion 55
Let me welcome, with great pride, the first publication of the Polytechnic of Namibia Annual Research Report, which captures our research activities and outputs during the 2012 academic year. A report of this nature demonstrates the importance that Polytechnic places on research and innovation as we transition to the Namibian University of Science and Technology.

During 2012, we took a number of significant steps to bring greater focus to our research and innovation efforts and to increase our research output. These included developing the necessary policy framework, implementing a number of strategies to foster a stronger culture of research and innovation, and building research capacity. Faculty responded positively to these initiatives and I have no doubt, as we go into the future, that the institution will reap the benefits and rewards.

Given the likelihood that financial resources will continue to diminish, it is necessary to consider how we can maximise efficiency from the investments we make in research and innovation. In our Research Strategy, we have adopted an interdisciplinary approach by organising research into niche areas that are aligned with national priorities. We will further refine our strategy by identifying the areas in which we have a potential to become world class and prioritise resources for building those niche areas. Having established many national and international partnerships, the question now is how can we strategically use these relationships to bolster our research, to share costs and help us stay at the cutting edge of innovation.

A most relevant consideration is whether our research endeavour contributes to the economic and social development of the country. If our research is to gain greater traction, it is essential that we increase the interactions between our researchers, government, civil society and industry. Our solution-driven research activities will lead to increasing numbers of spin-offs, patents and licenses, consultancies and commissioned research. As Namibia’s leading tertiary educational institution, this is the direction we need to take.

Finally, I would like to thank our partners and sponsors for their considerable financial support. The list is impressive and we are very grateful for their assistance in this vital joint endeavour. I would also like to acknowledge the Vice-Rector: Academic Affairs and Research, Dr Andrew Niikondo, for the leadership he provides to our research endeavours, and the researchers, whose contribution to the knowledge pool is recognised in this publication.
On the publication of the Polytechnic of Namibia's first formal institutional research report, it is satisfying to note that 2012 was a fruitful year both in terms of research developments and research activities.

The Polytechnic of Namibia has maintained and improved its track record of research performance in recent years, in terms of both quality and quantity of outputs. It is particularly gratifying to acknowledge that this was achieved under conditions of substantial financial constraint. Our institution had no choice but to cut its research budget and thus research projects were negatively affected.

Despite these challenges, on the eve of becoming Namibia’s first University of Science and Technology, the Polytechnic of Namibia possesses an admirable research milieu and culture that provides space for intellectual development, debate and the flourishing of ideas. This translates into an increasing number of practical outputs, including:

- Contributions to civil society, Government and industry;
- Important contributions to national public debate enhancing the intellectual life of Namibia;
- Recognition both at home and internationally, most visibly shown by the quality of local and international academics that visit Polytechnic of Namibia; and
- Conferences, seminars and public lectures that are held throughout the year.

The Polytechnic of Namibia takes pride in its research ethos and remains committed to maintaining its distinctive position in applied research as provided in the Polytechnic of Namibia Act 33 of 1994 and the Polytechnic Strategic Plan (PSP) III and IV, as well as in our new research strategy, (detailed overleaf), that is designed to make a very practical contribution across a number of nationally important sectors.

The year’s research highlights have been selected by the Deans, Heads of Departments and Directors of Centres and are listed in their respective sections. These highlights really demonstrate the breadth and depth of our endeavours. This report also details the Polytechnic of Namibia’s most significant research outputs to reflect our research capacity.
The Institutional Research and Publications Committee

A vital factor that enables research to flourish is the seed funding which is provided by the Polytechnic itself. In 2012 the committee provided funding for 59 projects with a total of more than N $ 1,277,000.

Additional Research Support Activities

The Polytechnic’s commitment to research outputs was particularly supported by a Research Retreat that took place to provide time for researchers to develop and finish their research writing, articles, chapters, proposals and theses. In addition, Researchers of the Year were selected at the department, school and institutional levels. Initiatives like these through which researchers’ achievements are recognised, provide important motivation.

Dr. Kasper Jensen of the School of Information Technology was the winner of the 2012 Researcher of the Year Award.

Other activities included an important research workshop which focused on developing capacity in the area of statistical analysis for both early and established researchers. Individual Schools also held a number of Research Days during which research findings and outputs were presented to the academic community. The Polytechnic of Namibia also extended to support to a large number of individual researchers to enable them to attend conferences and thus publish their valuable work.
Polytechnic of Namibia’s new Research Strategy

The primary aim of the Polytechnic of Namibia, as a core national education institution, is to build capacity that is fundamental to the development of a knowledge-based society in line with Vision 2030.

In addition to our quest for excellence in teaching and learning, the Polytechnic of Namibia focuses on Applied Research, in the context of a unique Southern African environment, and in partnership with Government, Industry and the wider Namibian Community.
Research Impact

To develop research that has national, regional, and international impact, it is necessary to prioritise the deployment of the Polytechnic’s resources based on three equally weighted criteria. Thus we focus on Applied Research that:

- Ensures that we deliver practical solutions for all sectors of the Namibian Community;
- Is in line with national priorities which ensures that our use of resources aligns with Namibia’s strategic goals; and
- Leverages the distinctive geographical and cultural opportunities Namibia and Southern Africa afford us and gains the Polytechnic of Namibia international recognition.

Guiding Principles

The implementation of the Polytechnic of Namibia’s Research Strategy is based on the following guiding principles for the planning, designing, application and monitoring of research projects, and the evaluation of research outputs. Research projects should be:

- **Solution driven**
  Research promotion efforts should be directed towards specific practical solutions that enhance self-effectiveness and community empowerment.

- **Participatory**
  Stakeholders should be engaged throughout the research process.

- **Multi-disciplinary**
  Cooperative research across Schools is necessary and is to be encouraged.

- **Sustainable**
  Research programs should aspire to create cost efficient and sustainable social change.
School of Economics and Finance

The School of Economics and Finance is made up of the Departments of Economics, Marketing and Accounting. The School was formed in 2012. The Departments that make up this School were previously housed in the School of Business and Management. As far as research is concerned the School of Economics and Finance is performing well, with the Department of Economics leading in this respect, followed by the Department of Marketing. It is the hope of the School that the momentum that has been built up, will continue as the Polytechnic of Namibia transitions into the Namibia University of Science and Technology (NUST).

The School of Economics and Finance has a long-standing history in research and publication. It has been conducting research seminars once a week and working to establish a journal on research. The purpose of these activities is to harness the research capacities within the school, and encourage upcoming researchers to produce research outputs and in-house research experiences that can be shared widely.

Promotion of research, specifically applied research, is a prerequisite for transforming PoN to NUST. The value of research is particularly emphasised for the purpose of encouraging the academic faculty to acquire culture of research and ultimately to encourage all academics and students to participate vigorously in research.

In 2012, the School did not receive funding for conducting research. Nevertheless, the Departments envisage that they will be able to identify projects and request both internal and external funds in future.

At the moment, the School has not yet established research clusters. Bearing in mind the importance of this function, the School is working towards establishing research clusters in the near future. This will be done in collaboration with the other schools in the Polytechnic of Namibia and beyond.

There has been a strong collaboration with other universities and schools at individual level. These collaborations yielded a number of international journal article publications and international conference joint paper presentations, details of which can be observed in the Publications section below. Indeed, a number of staff members in the School have published with top quality publishers such as Oxford and Inderscience.
The implementation of the Polytechnic of Namibia’s Research Strategy is based on the following guiding principles for the planning, designing, application and monitoring of research projects, and the evaluation of research outputs.

- **Solution driven:** Research promotion efforts should be directed towards specific solutions that enhance self-efficacy and community empowerment.
- **Participatory:** Stakeholders should be engaged throughout the research process.
- **Multi-disciplinarity:** Cooperative research across Schools is encouraged.
- **Sustainability:** Research programs should aspire to create cost effective, sustainable social change.

**Publications**


School of Engineering

Engineering is the engine that drives the technology, which invariably brings about the prosperity of nations. In his foreword in the 1998 prospectus, the Rector of the Polytechnic of Namibia; Prof Tjama Tjivikua, states "We are committed to technology because it advances the development and influences the way in which we live; it literally permeates every facet of modern life."

The School of Engineering is therefore committed to excellence in service to our clientele: both our students and Namibian industry. In the process of advancing engineering education in Namibia, we also advance the development of the nation as our ultimate goal.

The School was established in 1996 and are the oldest engineering training school in the country. This relatively long history of training in the engineering fields is one of our key competitive advantages. We have developed several national and international collaborations with highly respected universities around the world. The activities within these collaborations raise the standard of our teaching and research to a world class level.

The research activities of the School are carefully chosen to respond to national imperatives as presented in the National Development Plans (NDPs), and the national vision 2030. Global trends and our in-house capacity, coupled with a broad- spectrum of support from our numerous national and international partners, informed our research fields, which are:

- **Renewable Energy**: This research group focuses on the development, analysis, design and implementation of renewable energy systems and technologies. In addition the group researches in the efficient ways of energy usage and sustainability.

- **Water Resource Management**: This group looks at efficient ways of generating, distributing and re-using of water resources.

- **Manufacturing Systems**: This group spans from manufacturing systems in the fields of mechatronics, control systems to the development, design and manufacturing of appropriate technologies. It also tailors its activities to support small and medium scale manufacturing industries.

- **Mining Sustainability and Environmental Impact**: This new research group focuses on environmental issues relating to mining activities in Namibia.

- **Windhoek and its Environs - Architectural Perspective**: The Architectural Department is conducting research on the architectural landscape of Windhoek and its environs.

The School of Engineering believes in the sustainability of its research activities, and, to this end, has developed graduate programmes in Industrial Engineering, Integrated Water Management and Transportation Technology. The School plans to introduce two more Master Degree programmes in Renewable Energy and Mechatronics in the near future.
Funding

<table>
<thead>
<tr>
<th>Donor</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union</td>
<td>N$ 966,000</td>
</tr>
<tr>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit, Germany</td>
<td>N$ 12,000,000</td>
</tr>
<tr>
<td>Bundesministerium für Bildung und Forschung, Germany</td>
<td>N$ 523,000</td>
</tr>
<tr>
<td>Swedish International Development Agency</td>
<td>N$ 430,000</td>
</tr>
<tr>
<td>Rent-A-Drum, Namibia; Molok Oy, Finland</td>
<td>N$ 200,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>N$ 14,119,000</td>
</tr>
</tbody>
</table>

Projects

*Water Demand Management*, a collaboration with the Tampere University of Technology, Finland.
contact: Damas Mashauri at dmashauri@polytechnic.edu.na

*Water and Environmental Management*, a collaboration with the Lund University, Sweden.
contact: Damas Mashauri at dmashauri@polytechnic.edu.na

*Material Recovery Facility*, a collaboration with the University of Tampere, Finland.
contact: Damas Mashauri at dmashauri@polytechnic.edu.na

*Future of Okavango*, a collaboration with the Friedrich Schiller University Jena, Germany.
contact: Damas Mashauri at dmashauri@polytechnic.edu.na

*Staff Development*, a collaboration with the FH Aachen University of Applied Sciences, Germany.
contact: Victor Kamara at vkamara@polytechnic.edu.na

*Facility Management*, a collaboration with the Cape Peninsula University of Technology, South Africa and Karlsruhe Institute of Technology, Germany.
contact: Victor Kamara at vkamara@polytechnic.edu.na

*Residential Time of Use Energy Modelling and Tariff Evaluation*
contact: Mr. Gideon Gope at ggope@polytechnic.edu.na

*An Assessment of the Wind Resources of Namibia*
contact: Mr B Siepker at bsiepker@polytechnic.edu.na

*Investigation of the Solid State Interaction of Ruthenium and Rhodium with Silicon Carbide and the Potentiality of Using the Metal Elements as Schottky Contacts for High Temperature Operating Schottky Diodes*
contact: Mr Kinnock Munthali at kmunthali@polytechnic.edu.na

*Design of a Machine to Extract Mangetti Nuts*
contact: Mr. Andrew Zulu at azulu@polytechnic.edu.na
Publications


School of Health and Applied Sciences

The School of Health and Applied Sciences started in 2007 and hence it is relatively a new school at the Polytechnic of Namibia (PoN). The School currently hosts three departments, namely: Mathematics and Statistics; Bio-medical Sciences and Environmental Health Sciences. Since inception, the School has transformed from a relatively small, predominantly undergraduate teaching one to one that actively fosters excellence in its three fundamental pillars - research, teaching, and community service.

Despite being a relatively new school in the institution, the School of Health and Applied Sciences (SHAS) has made tremendous strides in research. The aim of the School is to conduct quality research whose results and expertise will be commercially and community-directed in response to national, regional and global needs.

One of the highlights of the year was our first school research day, held in May 2012, the purpose of which was to motive faculty and students to engage in research, and to showcase the current staff and student research activities. With the theme Promoting a Research Culture, it was hoped that the School would continue in future to be recognised nationally, regionally and globally as a leader in health and applied sciences.

The research day was graciously opened by the Rector, Prof Tjama Tjivikua. The school was fortunate to have renowned academics Dr Michael Good (Australia), Dr Chikwelu Obi (Walter Sisulu University), and Dr Lorna Holtman (University of the Western Cape) as invited guest speakers. In addition to the plenary lectures given by the three invited guest speakers, faculty and students presented oral and poster presentations. The day ended with a prize-giving ceremony of best posters by students as assessed the guest speakers. The ceremony was conducted by the Dr Andrew Niikondo (Vice Rector: Academic Affairs and Research).

Funding

The School is grateful for both internal and external financial support received. Without this support, the research would not have been possible. The table below shows the new funding received in 2012.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRPC Institutional Research &amp; Publication Committee</td>
<td>N$ 257,000</td>
</tr>
<tr>
<td>DST Department of Science &amp; Technology at the Ministry of Education</td>
<td>N$ 195,000</td>
</tr>
<tr>
<td>SIDA Swedish International Development Cooperation Agency</td>
<td>N$ 374,000</td>
</tr>
<tr>
<td>Total</td>
<td>N$ 826,000</td>
</tr>
</tbody>
</table>
Highlights

In addition to the research day in May 2012 mentioned above, the School hosted a 2-day workshop at the Polytechnic of Namibia, Hotel School during 4-5 December 2012 entitled *Colloid Science to Improve Water Purification and Contaminated Soil Remediation with Natural Products*. This workshop was funded by the Swedish International Development Cooperation Agency (SIDA) through the Swedish Research Links Programme (VR/SIDA research contract No. 348-2011-7241). The research contract is a 3-years joint project with Uppsala University (Sweden) and University of Botswana. The workshop was opened by the Honourable John Mutorwa, Minister of Agriculture, Water and Forestry (MAWF).

The Honourable Minister, in his keynote address, outlined some Government policies and investments made in the last 20 years so that the population had access to safe water. He welcomed further initiatives are aimed at mitigating problems associated with water quality in the country.

In his welcoming remarks earlier, the Rector, Prof Tjama Tjivikua, thanked the Swedish International Development Agency (SIDA) through the Swedish Research Links Programme for providing funds for such a workshop for the benefit of our country, Namibia. He reiterated his belief that water is basic human need and essential for survival. Access to basic minimum quantity and safe water is everyone’s right. A large number of diseases, including diarrhoea, dysentery, and cholera are caused by unsafe water, leading to negative impacts in both short term as well as in the long term. The Rector further recalled a comprehensive description of poverty from the ‘voices of the poor ’ collected by the World Bank from 60,000 poor people from 60 countries as:

“Poverty is hunger; poverty is lack of shelter; poverty is being sick and not able to see a doctor; poverty is not being able to go to school and not knowing how to read; poverty is not having a doctor; poverty is not being able to go school and not knowing how to read; poverty is not having a job; poverty is fear for the future; living one day at a time; poverty is losing a child or illness brought about by unclean water; poverty is powerlessness; lack of representation and freedom.”

The participants of the workshop came not only from Windhoek but from as far as Orangemund, Katima Mulilo, Opuwo, Oshakati, etc. This clearly shows the wide-spread need for affordable technology for safe drinking water for us all. Each participant received a certificate of attendance, and seedlings or seeds at the end of the workshop, facilitatited by Prof Adrian Rennie (Uppsala University, Sweden), Dr Bonang Nkoane (University of Botswana) and Dr Habauka Kwaambwa (Polytechnic of Namibia).
Projects

*Exposure to Zoonotic Diseases among Namibian Blood Donors – Pilot Study*
contact: Elzabe van der Colf at evancof@polytechnic.edu.na

*Tires As Environmental Hazards for Public Health: Mosquitoes in Low Income Areas of Windhoek*
contact: Larai Aku Akai at lakuakai@polytechnic.edu.na

*Studies of Water Treatment Protein Extracted from Seeds of Moringa Tree*
contact: Habauka Kwaambwa at hkwaambwa@polytechnic.edu.na

*Anthropogenic Enhancers of Climate Change and Variability in Namibia*
contact: Nnenesi Kagabi at nkagabi@polytechnic.edu.na

*Prevalence of Noise Induced Hearing Loss in University Students Using Personal Music Devices: A Case Study of Polytechnic of Namibia.*
contact: Dingilizwe Mazibuko at dmazibuko@polytechnic.edu.na

*Investigation into the Effects of Occupational Exposure to Charcoal Dust*
contact: Ndinonhola Hamatui at nhamatui@polytechnic.edu.na

*In Vivo Hepatotoxic Response of Short Term Exposure to Mycotoxins in Pearl Millet as Substantiated by Immunolocalization in Rat Liver*
contact: Christo Isaaks at cisaaks@polytechnic.edu.na

*Comparing the Nutritional Quality in Two Moringa Species Grown in South Africa and Namibia*
contact: Jeya Kennedy at jkennedy@polytechnic.edu

*Discrete Optimization Model for 2-dimensional Energised Waves*
contact: Sunday Reju at sreju@polytechnic.edu.na

*Colloid Science to Improve Water Purification and Contaminated Soil Remediation with Natural Products*, a collaboration with the University of Botswana and Uppsala University.
contact: Habauka Kwaambwa at hkwaambwa@polytechnic.edu.na

*Development of Lysin-Chitosan Functionalized Therapeutic Polymer against Group B Streptococci (GBS)*
contact: Sylvester Moyo at srmoyo@polytechnic.edu.na
Publications


School of Humanities

The School of Humanities witnessed an unprecedented interest in research this year. Firstly, there were 11 PhD registrations and five Masters registrations amongst the faculty. This was in keeping with the thrust on research by the Vice-Rector Academic Affairs and Research, Dr. Andrew Niikondo. Dr Sarala Krishnamurthy, Dean of the School of Humanities, gave a presentation on Charles Dickens at the August Seminar Series as part of the Bi-centenary celebrations of Charles Dickens all over the world. This Victorian novelist is considered to be the second most popular writer in the world after Shakespeare. Even after 200 years, his works are read by people of different age groups. His insight into human nature and his descriptions of industrial England during the Victorian Age ring true even today.

Further, a reknown Professor of Linguistics from Birmingham, England, visited us in May to conduct a workshop in Corpus Linguistics which was thrown open to the whole School. Faculty from the three departments: Communication, Languages and Media Technology were engaged in the computer lab to learn to use software applications to conduct language analysis. We also had several important international faculty, all senior professors, who addressed us on research in the humanities. Several of our own researchers within the School made presentations of their work in the seminar series which was a huge success. It lead to many discussions and debate within the School departments. Several first time researchers also made presentations after gaining confidence and learning from presentations given by their seniors.

Publications


School of Information Technology

The School, with its four Departments of Basic Computer Studies, Business Computing, Computer Systems and Networks, and Software Engineering, offers a variety of undergraduate and postgraduate programmes to support the objectives of Namibia’s Vision 2030 through capacity building. A well-founded education, which includes research, forms the basis for Namibia’s successful transformation into a knowledge-based society. The School of IT is committed to this process, with the support of highly skilled and motivated academic staff. Professor Jill Slay’s appointment, as the new Dean at the School of Information Technology, further extended the School’s research activities.

The School’s most notable research activities, in recent years, have focused on Community-centred localisation led by Heike Winchiers-Theophilus, the Mobile Computing led by Kasper Jensen, and the Mobile Content and Applications for Entrepreneurship Development led by Hippolyte Muyingi. With new appointments, the School complemented this existing research with other important fields of research like Computer Forensics led by Jill Slay, Health Information Systems led by Tiko Iiyamu and Mobile Sensor Data Processing led by Klaus Wieder.

These Research Clusters enable the School to deliver practical solutions for the Namibian community. Multi-disciplinary applied research in a Southern African context is a key requirement in the Polytechnic of Namibia’s new Research Strategy, which was introduced this year, and the School is committed to this.

Funding

To achieve the research objectives and targets, the School collaborates with a wide range of selected partners and stakeholders in Namibia and abroad. We would therefore like to extend our sincere gratitude to all our partners, funding agencies, NGOs and communities for joining hands in making our research activities possible.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRPC Institutional Research &amp; Publication Committee</td>
<td>N$ 483,000</td>
</tr>
<tr>
<td>IRPC Institutional Research &amp; Publication Committee (2012-2013)</td>
<td>N$ 350,000</td>
</tr>
<tr>
<td>MoE Ministry of Education, Namibia</td>
<td>N$ 152,000</td>
</tr>
<tr>
<td>Total</td>
<td>N$ 985,000</td>
</tr>
</tbody>
</table>

Total N$ 985,000
Research Clusters

Clustering research efforts improves the efficiency of the School’s research. The School set up a number of research clusters as listed below:

- **Community-centred localisation**
  The research cluster, led by Heike Winschiers–Theophilus, has been running since 2008, with the current focus of development of a community based indigenous knowledge management system. The development of the system is motivated by the interruption of generational local knowledge transfer, due to an increasing temporal rural-urban migration.

- **Mobile Futures Lab**
  Kasper Jensen is leading the Mobile Future Lab, which is focusing on sustainable solutions for near-future Namibia with potential for high socio-economic and environmental impact. The research is situated in the cross field of mobile, ubiquitous and context-aware computing with emphasis on holistic solutions that incorporate all levels from human users to back-end software architectures. These solutions are based on emerging mobile platforms such as sensor- and network- enabled smartphones and tablet computers.

- **Mobile Content and Applications for Entrepreneurship Development**
  This cluster research project intends to establish an applied- and action research platform for mobile applications and mobile web services framework for Namibia in three niche areas: Entrepreneurship Development, Education Enhancement, and General Services. Existing and emerging m-business world research and application results will be considered and adapted as well as innovative approach to address local community and business needs and constraints.

New emerging Research Groups and Clusters include:

- **Forensic Computing and Security Research Group**
  This research group, led by Jill Slay, focuses on making the Internet more secure and a safe place for civil society and government. This increases productivity, as less time is be spent on detecting and recovering from cyber-attacks.

- **Health Informatics Research Cluster**
  This cluster is led by Tiko Iiyamu. It focuses on the development, implementation, and integration of Health Information Systems. This includes readiness assessment, evaluation, and architecture of Health Information Systems on traditional Client/Server platforms, as well as technologies used for mobile and cloud computing.

- **Mobile Sensor Data Processing**
  Klaus Wieder is leading this research cluster, which aims at the reliable collection, curation and application of data generated by remote and mobile sensor devices. This multi-disciplinary research does not only include vehicle and train tracking but also classical wildlife and life-stock tracking. Next to the data collection and transport, the development of useful software applications is the main concern of this research cluster.
Highlights

Kasper Jensen was awarded with the Institutional Researcher of the Year 2012 Award.

Projects

*Indigenous Knowledge Management System*, a collaboration with the University of Aalborg, Denmark, Meraka Institute, South Africa, University of Cape Town, South Africa and Universiti Malaysia Sarawak, Malaysia.
contact: Heike Winschiers-Thephilus at hwinschiers@polytechnic.edu.na

*Mobile Phone Information Services for Hiv/Aids Awareness for Teenagers*
contact: Hippolyte Muyingi at hmuyingi@polytechnic.edu.na

*Computer Technology Disruption in the Class Room - Namibia Case Study*
contact: Hippolyte Muyingi at hmuyingi@polytechnic.edu.na

*A Platform for Mobile and Ubiquitous Applications in the Namibian Context*, a collaboration with the University of Cape Town, South Africa, Swansea University, UK, Aalborg University, Denmark, Microsoft Research India, and Columbia University, New York. contact: Kasper Jensen at kljensen@polytechnic.edu.na

contact: Kasper Jensen at kljensen@polytechnic.edu.na

*Resilient Cyber Systems*, a collaboration with the University of South Australia IA research group, Idaho State University, USA, and the International Information Systems Security Certification Consortium.
contact: Jill Slay at jslay@polytechnic.edu.na

*Investigating the Effects of Usability in Client-side Applications Security on Overall Network Security*, a collaboration with the Nelson Mandela Metropolitan University, South Africa.
contact: Fungai Bhunu-Shava at fbshava@polytechnic.edu.na

contact: Klaus Wieder at kwieder@polytechnic.edu.na

*Supporting the Optimisation of the Land-Based Transportation Infrastructure of Namibia - A Pilot Study*, cluster: Mobile Sensor Data Processing.
contact: Klaus Wieder at kwieder@polytechnic.edu.na
Publications


School of Management

The School of Management is currently made up of the following departments: Business Management, Office Management and Technology, Human Resources, and Transport and Logistics. This School is still trying to find its feet as far as research is concerned, but made some strides in this direction, especially through the Harold Pukewitz Graduate School of Management. We recognise that more still need to be done to encourage all the other Departments in the School to make the first step towards research and publications.

Through its research activities the School of Management (SOM) provides a crossing point between the School and the business community. It continually keeps abreast of trends, changes and developments in business so that it can quickly incorporate “real world” issues into its curriculum and research agenda. The School’s publications explore faculty findings, connecting scholarly research with industry practice through discussions on timely business issues and distillation of cutting-edge faculty research through public lectures that the school normally organises, and occasional radio and television interviews they provide to business and the public at large.

Our research output spans a wide range of topics, interests, and functions producing original research and promotion of public dialogue. The School strengthens its research niches in leadership development, organisational development and change, talent and career management, industrial relations and employee management, decentralisation, regional and local government developmental imperatives, public and private partnerships (PPP) & economic development, creativity and innovation, entrepreneurship, and the role of small and medium-sized enterprises.

The School did not receive funding for conducting research either internally and externally. However, we envisage that we will be able to identify projects and request funding, both internally and externally, in future.

At the moment, the School has not yet established research clusters. Research clusters will be established in the near future, after the School has conducted a dialogue between School departments and also with other Schools in the Polytechnic.

Publications


School of Natural Resources and Tourism

The School of Natural Resources and Tourism is well known within the Polytechnic and beyond for engaging in high quality research. The School has participated in development projects through its three centre/institutes: Earth Observation and Satellite Application (EOSA), Integrated Land Management Institute (ILMI) and the Agric-Business and technology Development Centre (ABTDC). These centres give faculty and students opportunities to apply their knowledge and skills to solve real life challenges and thus serve the nation at large. The School boasts of a very solid and vibrant teaching, learning and research environment supported by an modern IT infrastructure, equipment, labs and modern library. The School hosts a number of international scholars each year and coordinates and manages a number of international projects.

The School’s research activities are aimed at enhancing the sustainability and resilience of eco-systems in which people can derive and improve their livelihoods as they live in harmony with the rich biodiversity. Our research activities are informed by the National Development priorities, as crafted in national development plans, (NDPs), coupled with recognition of the impact of land use and climate variability and change that can in turn impact on the population and the environment. We do this through four broad research clusters that are of multi-disciplinary in nature. The four clusters and their main objectives are:

- The Land, Agriculture and Water (i.e. L.A.W.) group, which focuses on sustainable utilisation of land, agriculture and water resources that improves productivity and conservation;
- The Eco-systems and Biodiversity (i.e. Eco-Bio) group, focusing on improvement of ecosystems functions and services by promoting conservation of biodiversity;
- The Wildlife and Tourism (i.e. W.I.T) group, which aims at promoting sustainable management of wildlife and their habitat for eco-tourism activities for wealth creation;
- The Development and Application of Spatial Technologies and Tools (i.e. D.A.S.T) group that focuses on development and promotion of the use of GIS and RS tools for sustainable natural resources management.

Though research in the latter is independent of the other groups, our aim for this group is to support the top three clusters.

We collaborate with a wide range of partners and stakeholders in Namibia and abroad to help achieve our research objectives and targets and we would like therefore to extend our sincere gratitude to all our partners, funding agencies, NGOs and communities for joining hands in making our research activities possible.
**Funding**

<table>
<thead>
<tr>
<th>Donor</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMBF</td>
<td>N$ 8,000,000</td>
</tr>
<tr>
<td>BMBF</td>
<td>N$ 1,130,000</td>
</tr>
<tr>
<td>BMBF</td>
<td>N$ 350,000</td>
</tr>
<tr>
<td>EU</td>
<td>N$ 26,000,000</td>
</tr>
<tr>
<td>NRF</td>
<td>N$ 920,000</td>
</tr>
<tr>
<td>IRPC</td>
<td>N$ 983,000</td>
</tr>
<tr>
<td>SDC</td>
<td>N$ 202,000</td>
</tr>
<tr>
<td>MBN</td>
<td>N$ 456,000</td>
</tr>
<tr>
<td>USAID</td>
<td>N$ 4,500,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>N$ 42,541,000</strong></td>
</tr>
</tbody>
</table>

**Projects**

*Agronomic Benchmarks and Farming Systems in Kavango Region*, cluster: Land, Agriculture and Water.
contact: Ibo Zimmermann at izimmerman@polytechnic.edu.na

*Determination of People’s Perception and Acceptance of Rainwater Harvesting in North Central Region*, cluster: Land, Agriculture and Water.
contact: Ibo Zimmermann at izimmerman@polytechnic.edu.na

*Southern Africa Agricultural Model Inter-Comparison and Improvement Project (SAAMIIP)*
contact: Ibo Zimmermann at izimmerman@polytechnic.edu.na

*An Evaluation Perspective: Geographic Information Systems Technology for Geography Teaching in Namibian Secondary Schools*
contact: Michael Mutale at mmutale@polytechnic.edu.na

*Paradigm Shifts in Real Property Valuation Methodologies: Blending Market Fundamentalism with Rationality*
contact: Jacob Babarinde at jbabarinde@polytechnic.edu.na
The Wildlife and Aircraft Research Namibia (WARN) project uses ecological research to reduce the risk of aircraft-wildlife collisions at Namibia’s two main airports, cluster: Eco-systems and Biodiversity.
contact: Morgan Hauptfleisch at mhauptfleisch@polytechnic.edu.na

Classification and Description of the Vegetation of the Farm Klein Boesman, cluster: Eco-systems and Biodiversity.
contact: Willie Adank at wadank@polytechnic.edu.na

Impacts of an Episodic Resource Pulse on Riparian Vegetation in Ephemeral River of the Namib Desert
contact: Barbara Curtis at bcurtis@polytechnic.edu.na

Proposed Flood Mitigation Measures for the Oshakati/Ongwediva Area Ecology Specialists
contact: Shirley Bethune at sbethune@polytechnic.edu.na

The Dynamics of Bush Thickening by Acacia Mellifera in the Arid Highland Savanna of Namibia
contact: Dave Joubert at djoubert@polytechnic.edu.na

The Development of a Decision Support System (DSS) for Semi-arid Highland Savanna Rangeland Management, cluster: Eco-systems and Biodiversity.
contact: Dave Joubert at djoubert@polytechnic.edu.na

Toward an mPolicing Solution for Namibia: Leveraging Emerging Mobile Platforms and Crime Mapping
contact: Sebastian Mukumbira at smukumbira@polytechnic.edu.na

Bridging Urban-rural Disparities in Namibia for Vision 2030: A Human Development Index (HDI) Approach
contact: Jacob Babarinde at jbabarinde@polytechnic.edu.na
Company Valuation in Sub-Sahara Africa and the Role of News: Blending Rationality with Market Determinism  
contact: Jacob Babarinde at jbabarinde@polytechnic.edu.na

Conflict Resolution in Project Location Decision-Making: The Case of Old Ibadan Airport Commercialisation Project  
contact: Jacob Babarinde at jbabarinde@polytechnic.edu.na

Livestock Poisoning by Dichapetalum Cymosum: Economic Losses and Poisoning Aversion by Goats  
contact: Mutjinde Katjiua at mkatjiua@polytechnic.edu.na  
Land Use Impacts on Vegetation Distribution, Plant Species Structure, and Edaphic Factors in the Northern Kalahari Rangelands  
contact: Mutjinde Katjiua at mkatjiua@polytechnic.edu.na

Development of a Hydraulic Model for the Kavango River for Improved Disaster Risk Management in Namibia  
contact: Kelebogile Mfundisi at kmfundisi@polytechnic.edu.na

Assessing the Availability of Land and Water Resources for Production of Energy Crops in Southern Africa  
contact: Kelebogile Mfundisi at kmfundisi@polytechnic.edu.na

contact: Kelebogile Mfundisi at kmfundisi@polytechnic.edu.na

Growth Models for Selected Woodland Species in Namibia, cluster: Eco-systems and Biodiversity.  
contact: Vera DeCauwer at vdecauwer@polytechnic.edu.na

Timber Provision of Woodlands, cluster: Eco-systems and Biodiversity. contact: Vera DeCauwer at vdecauwer@polytechnic.edu.na

Change in Biomass Productivity of the Etosha National Park: 1985 to 2010, a collaboration with the University of Namibia.  
contact: Patrick Graz at fgraz@polytechnic.edu.na

The Impact of Water Point Closure on the Recovery of Native Vegetation, a collaboration with the University of Ballarat, Australia.  
contact: Patrick Graz at fgraz@polytechnic.edu.na
The Long-term Development of Arid Land Vegetation Subject to Fire, Flooding and Grazing, a collaboration with the University of Ballarat, Australia.
contact: Patrick Graz at fgraz@polytechnic.edu.na

Modelling the Effect of Water-point Management on Grazing Activity, a collaboration with the University of Ballarat, Australia.
contact: Patrick Graz at fgraz@polytechnic.edu.na

Assessing Land Use and Land Cover Change Trajectories in the Caprivi Region, Namibia (PhD Project), a collaboration with the University of Pretoria.
contact: Patrick Graz at fgraz@polytechnic.edu.na

Optimizing Non-flooded Landscape Units for Crop Production in the Caprivi Region, Namibia (PhD Project), a collaboration with the University of Namibia. contact: Patrick Graz at fgraz@polytechnic.edu.na

Publications


Centre for Cooperative Education

The Polytechnic of Namibia (PoN) has identified the need to bridge the gap between itself and the business communities as well as create an environment which could contribute significantly to the needs of all sectors in which students are afforded the opportunity to apply theoretical knowledge gained in a practical work environment. The Centre for Cooperative Education (CCE) was established at the Polytechnic with the main purpose of facilitating relationships with industry between the PoN, private and public sectors, Non-Governmental Organisations and community at large.

The Centre is further responsible for supporting the implementation of various modalities of cooperative education including service-learning, project based learning, simulations and encourage multi-disciplinary student research for the purpose of work-integrated learning (WIL). We believe that the successful operation of the Centre will contribute to the development of the Namibian economy and enhance student’s employability. Evidence of the institutional commitment to this mandate is that 10% of the total undergraduate degree programmes must be awarded through WIL.

The Centre has initiated several research projects and encouraged all staff members to engage in research activities. The need for greater research in the area of WIL and related modalities is critical if the quality of implementation of the Cooperative Education strategy is to be strengthened. Supervision of honours and masters students is ongoing.

Funding

We are grateful for any kind of financial support we received. Without this support the research done would not have been possible.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoE</td>
<td>Ministry of Education: South Africa-Namibia Joint Science and Technology Research - Human Resource Development in Emerging Countries</td>
</tr>
<tr>
<td>MoE</td>
<td>Ministry of Education: National Strategy for Cooperative Education</td>
</tr>
<tr>
<td>IRPC</td>
<td>Institutional Research &amp; Publication Committee</td>
</tr>
<tr>
<td>DAAD</td>
<td>Deutsche Akademischer Austauschdienst, Germany</td>
</tr>
<tr>
<td>Total</td>
<td>N$ 2,493,000</td>
</tr>
</tbody>
</table>
The Centre collaborates with the North-West University, South Africa on the human resource development in an emerging market. Student Research Development teams (SRDT) were set-up in collaboration with the Wismar University, Germany.

In order to improve the effectiveness and efficiency of our research efforts, the Centre organises its research in two broad research clusters that are multi-disciplinary and trans-disciplinary in their nature:

- Human Resource Development (Pedagogy and e-portfolio development)
- National Strategy/Policy for Cooperative Education (stakeholders include IUM, NCCI, NCHE and the Ministry of Education)

**Highlights**

The Director and two Industry Liaison Officers at the Centre went on an investigative visit to Wismar University, Germany in November 2012.

**Projects**

*Exploring the Effectiveness of a Work Integrated Learning Programme in Contributing towards the Employability of Graduates: the Graduate Intern’s Perspective*

contact: Carver Pop at cpop@polytechnic.edu.na

*Centre for Cooperative Education, Polytechnic of Namibia, Namibia*

contact: Delvaline Mowes at dmowes@polytechnic.edu.na

*Centre for Open and Lifelong Learning, Polytechnic of Namibia, a collaboration with the Department of Industrial Psychology, North-West University, South Africa.*

contact: Nicolene Barkhuizen at nbarkhuizen@polytechnic.edu.na
Namibian-German Centre for Logistics

The cooperation between the Polytechnic of Namibia and Flensburg University for Applied Sciences started back in 2003 with the signing of a partnership contract, and in 2004/2005 was raised to a DAAD-sponsored subject-related partnership project. The foundations of this partnership have always been a shared understanding of how successful projects should be managed and this has led to an ambitious and supportive university management on both sides of the Equator. This was an excellent framework for initiating the development of the Centre and also for managing the challenges inherent in evolving from a theoretical project to the reality of a working centre.

The collaborative day-to-day work on and for the Namibian-German Centre for Logistics (NGCL) since 2009, and the need to deepen and intensify cooperation in order to make the project a success, have created a high level of mutual trust and confidence. This partnership has by now reached a mature level, and close personal ties have been developed.

The NGCL was inaugurated in May 2009, with the focus of the completed first phase being the establishment of a training, research and technology transfer centre.

Research on logistics, which had not existed at an appreciable level in Namibia at all until 2009, has been kick-started. NGCL is now running a major research project called The State of Logistics in Namibia, which aims to provide an overview on the perception, importance, development and issues of logistics in the region and thus generating a point of departure for any future research on the topic. Research includes activities at all levels, be it from lecturers, students or NGCL-team members. Given these achievements it can be safely stated that the goals for the first phase have been accomplished.

During the first funding term, staff members and personnel developed new ideas for projects and activities of the Centre. The NGCL focuses on research into logistics and associated matters. Topic areas include:

- Logistics in Namibia
- IT support for logistics
- Logistics & trade in developing countries
- Logistics clusters

Research is geared toward supporting Namibia’s National Development Plan (NDP4), which cites logistics as one of the four economic imperatives. To achieve this, the main focus is on establishing and understanding the current state of logistics in Namibia. This is supported by basic research into specific, relevant aspects and collaborative efforts to determine the requirements and potential impact on developing countries. To ensure that such research is of practical use it has been disseminated, to industry and government stakeholders.
Collaborative work, with international partners, has also covered logistics related I.T. and supply chain risk management, both of which will play an important part in Namibia’s aspirations to become a logistics hub for the SADC region are to be achieved.

### Funding

<table>
<thead>
<tr>
<th>Donor</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAAD Deutscher Akademischer Austauschdienst, Germany (annual funding)</td>
<td>Euro 50,000</td>
</tr>
</tbody>
</table>

Collaboration with other (international) universities during 2012 has included:

- **State of logistics in Namibia** – in conjunction with Dr Andrew Jenkins of the University of Huddersfield (UK). This ongoing work investigating the state of logistics development in Namibia. Identifying barriers to development, needs for further research and, in particular, comparison to international (global) services. This provided base data that enabled us subsequently (2013), to start to investigate the industry’s ability to respond to the desire to build a logistics hub/cluster based in Walvisbay to serve Namibia & the SADC Region.

- **Impact of logistics service providers on supply chain “terminalisation” and transport geography** - in conjunction with Drs Eric Lambourdiere and Elsa Corbin of the Université des Antilles et de la Guayane, Martinique. This was part of a look at the way the nodes of supply chains have changed and, in turn, how this has affected geography as cities/regions/nations move from manufacturing to trading based economies. This work has also assisted with subsequent investigations into the nature and requirements of logistics hubs.

- **Potential impact of high capacity vehicles** – in conjunction with David Leach of the University of Huddersfield (UK). This was looking at the impact of increasing the maximum size of articulated vehicles without increasing the permitted payload (by weight). In its simplest form, idea is that, by addressing loads that “cube out” rather than “weight out”, one may be able to reduce the number of vehicles on the road with a concomitant reduction in pollution, etc. The work, which has been published in various formats created a considerable amount of controversy and opposition (e.g. from the rail lobby) and is still being considered by the British Parliament.

- **Location of logistics centres** – in conjunction with Drs Rudolph Kampf and Petr Průša of the University of Pardubice, Czech Republic. This was an earlier project that looked at the location of logistics centres in the Czech Republic. Its originality stemmed from an attempt to combine classical mathematical techniques (such as centre of gravity modelling) with more heuristic, social factors to try to develop a more holistic approach to depot location.
Highlights

The Centre organised and ran the 4th Annual Logistics and Transport Workshop, which took place in Walvisbay, September 25-28. Based around the theme of “Logistics a key catalyst for development in southern Africa”, it attracted stakeholder delegates from across the SADC region and drew on speakers from the Czech Republic, the UK, South Africa, Germany, Botswana as well as Namibia.

The Centre published two research reports and conference papers published in conference proceedings in Canada, the Czech Republic, Germany, Romania, Trinidad & Tobago and the UK as well as its first paper in a major international journal (Transport, Taylor & Francis).

The UK conference contribution received the best paper award at the Logistics Research Network conference, the first time this has been achieved by an African contributor.

Projects

State of Logistics in Namibia, a collaboration with the University of Huddersfield, UK. contact: Chris Savage at csavage@polytechnic.edu.na

Impact of Logistics Service Providers on Supply Chain “Terminalisation” and Transport Geography, a collaboration with the Université des Antilles et de la Guyane, Martinique.
Potential Impact of High Capacity Vehicles, a collaboration with the University of Huddersfield, UK. 
contact: Chris Savage at csavage@polytechnic.edu.na

Location of Logistics Centres, a collaboration with the University of Pardubice, Czech Republic. 
contact: Chris Savage at csavage@polytechnic.edu.na

Publications


Renewable Energy and Energy Efficiency Institute

The Renewable Energy and Energy Efficiency Institute (REEEI) represents the Polytechnic of Namibia’s dedicated commitment to serve as a national information resource base for renewable energy and sustainable energy use and management. The REEEI was established in October 2006 following the signing of the cooperation agreement between the Polytechnic of Namibia and the Ministry of Mines and Energy (MME).

It is mandated to facilitate and conduct research into renewable energy and energy efficiency; develop materials and standards, reports and disseminate information and materials on renewable energy and energy efficiency; and to facilitate cooperation between the MME and the Polytechnic, as a public institution primarily responsible for renewable energy and energy efficiency as well as cooperation with other stakeholders.

The Institute conducts research in renewable energy and energy efficiency technologies and related policies appropriate to the Namibian community. Projects include those geared at improving energy access, energy resource assessments, feasibility of new technologies such as concentrated solar power, procurement mechanisms for large scale renewable energy, energy efficiency in buildings, incorporating renewable energy and energy efficiency principles in national building codes, etc. Some of the projects are listed below.

**Funding**

We are grateful to all our local and foreign sponsors for the provision of funding and guidance in our various projects. Some of the major sponsors are listed in the table below.

<table>
<thead>
<tr>
<th>Donor</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy &amp; Environment Partnership with Southern and East Africa (2009-2014)</td>
<td>N $ 2,484,000</td>
</tr>
<tr>
<td>Ministry of Mines and Energy (2011-2014)</td>
<td>N $ 3,023,000</td>
</tr>
<tr>
<td>Global Environment Facility (2010-2013)</td>
<td>N $ 8,787,570</td>
</tr>
<tr>
<td>NamPower, Namibia (2009-2014)</td>
<td>N $ 500,000</td>
</tr>
<tr>
<td>Mobile Telecommunication, Namibia (2009-2015)</td>
<td>N $ 2,802,000</td>
</tr>
<tr>
<td>Austrian Development Agency (2009-2012)</td>
<td>N $ 866,000</td>
</tr>
<tr>
<td>Embassy of Finland (2011-2012)</td>
<td>N $ 966,000</td>
</tr>
<tr>
<td>Total</td>
<td>N$ 20,394,000</td>
</tr>
</tbody>
</table>
Renewable energy and energy efficiency research is by its nature multi-disciplinary. In 2012 the REEEI has collaborated with at least three lecturers and 10 students from the School of Engineering’s departments of Mechanical Engineering, Electrical Engineering, and Architecture at the Polytechnic of Namibia. Main areas of research collaboration were in the solar water heating, photovoltaics and green buildings respectively.

Collaboration with other universities continued through the Southern African Solar Thermal Training and Demonstration Initiative (SOLTRAIN) Project, where the Polytechnic worked together with University of Stellenbosch, South Africa, University of Eduardo Mondlane, Mozambique, and the Institute of Sustainable Energy AEE–INTEC of Austria.

**Highlights**

The Institute experienced several highlight in 2012:

- **REEEI Transformation to Namibia Energy Institute (NEI):** After recognising the important role that the REEEI has played in Namibia’s energy sector, and after widespread consultations, and convinced of the need and relevance of a national energy institute, the Cabinet of the Government of the Republic of Namibia approved the transformation of the REEEI to NEI (Cabinet approval, DECISION NO: 22ND/12.12.12/009) in December 2012.

  The NEI will encompass all energy sources, technologies and industries, and will have a new mandate that includes the establishment of four centres, viz.: Centre for Renewable Energy and Energy Efficiency; Centre for Petroleum, Oil and Gas; Centre for Electricity Supply; and Centre for Nuclear Sciences and Studies. It is expected that the services offered will be extended to the rest of the southern African development community (SADC), thus increasing the institute’s relevance and role.

- **Founding of the Green Building Council of Namibia:** The REEEI’s endeavour to promote energy efficiency has seen the founding of the Green Building Council of Namibia, which is now legally registered and operating.

- The SOLTRAIN project phase I ended in 2012, and phase 2 has now been approved for 3 years.

- Funding has been secured from the Global Environment Facility to carry out a full feasibility study on the establishment of a 5 MW concentrated solar power plant in Namibia.
Projects

Low Cost National Wind Resource Assessment in Namibia
contact: Helvi Ileka at hileka@polytechnic.edu.na

Investigating the Effectiveness of Introducing Energy Shops Countrywide as a Tool to Improve Access to Sustainable Energy Technologies
contact: Helvi Ileka at hileka@polytechnic.edu.na

Pre-feasibility Study for the Establishment of a Pre-commercial Concentrated Solar Power Plant in Namibia
contact: Helvi Ileka at hileka@polytechnic.edu.na

Improvement of Regulations and Building Codes for Energy Saving in Namibian Buildings
contact: Abraham Hangula at ahangula@polytechnic.edu.na

Provision of Auditing and Energy Marketing Services Organisation as a Catalyst for Adoption of Energy Efficient Technologies and Practices in Namibia
contact: Abraham Hangula at ahangula@polytechnic.edu.na

Development of Green Rating Tools for Buildings in Namibia
contact: Abraham Hangula at ahangula@polytechnic.edu.na

Techno-socio-economic Survey of Energy Efficiency in Namibia
contact: Abraham Hangula at ahangula@polytechnic.edu.na

Energy System Model for Namibia: Towards the Development of a National Energy Policy
contact: Helvi Ileka at hileka@polytechnic.edu.na

contact: Helvi Ileka at hileka@polytechnic.edu.na
Project Services Centre

In today’s knowledge landscape there are powerful drivers for multidisciplinary research. Through simple collaboration, researchers from different disciplines can accomplish more by teaming. Interdisciplinary research moves beyond simple collaboration and teaming to integrate data, methodologies, perspectives, and concepts from multiple disciplines in order to advance fundamental understanding or to solve real world problems. In this sense it provides a framework for discovery and innovation. This approach is pursued at the Polytechnic through its newly (March 2012) established Project services Centre. The Centre is established to promote, support and facilitate client-focused grant and project management services to enhance strategic multidisciplinary research capacity, innovation and development in the relevant fields of applied science and technology.

The Centre’s focus is guided by the various Schools, which identify key issues, niche areas and research clusters to solicit targeted sustainable funding opportunities from external funding agencies. The main functions of the Centre include grant identification, administration, acquisition and management within the research and capacity development areas. For this purpose, the Centre is divided into the following units:

- **Resource Mobilisation:**
  This unit is primarily responsible for grant identification, application and acquisition. This includes identifying strategic partnerships and networking opportunities.

- **Monitoring and Evaluation:**
  This unit is responsible for grant management, monitoring and evaluation of acquired projects. This includes risk control, impact analysis.

The potential for interdisciplinary research ultimately hinges on the extent to which individuals want to engage in it, and equally importantly if they have the opportunity to do so. Training researchers who can transcend the barriers that exist between the disciplines requires innovation in teaching and learning. In the quest towards transforming to a University setting, it is essential that our training programs largely focus on in depth training in a discipline or a set of closely related sub-disciplines.

The Centre promotes the view of strategic planning, project design, and evaluation not as discrete, disconnected activities, but as essential components of an integrated programming cycle that allows Schools and Centres to learn from experience. The PSC assists Schools and Centres with these core elements of the programming cycle.
Funding

In general funding agencies also encounters difficulties in facilitating interdisciplinary research, and must find creative mechanisms for overcome barriers, such as:

- Peer review systems that depend heavily on experts from single disciplines, and the reality that interdisciplinary peer review panels are not easy to assemble and operate.
- The extra time needed for interdisciplinary teams to learn develop a common language and framework for study is an impediment in a competitive system that is research output driven.
- How do we set performance goals for evaluating an interdisciplinary research program.
- Supporting interdisciplinary research requires an increased tolerance of risk.
- It is often the case that when an agency puts out a call for an interdisciplinary programme, pressure is felt from all sides to over-promise and under-budget, leading to the inevitable problem of under-performance.

Hence, at the PSC, effective grant management is more than simply keeping track of funds. It encompasses selection of projects and activities; grant identification and application; ensuring proper stewardship of funds and evaluating grant outcomes. Furthermore, it includes a demand assessment, strong partnership, and a detailed implementation plan with measurable, achievable goals.

On a global scale, during this reporting period, the donor community was focusing on green economic growth (with climate change and renewable energy as underlying areas); natural resource management; agriculture (specifically genetic engineering and biotechnology) and health sectors amongst others. To facilitate the search for research funding, the Polytechnic subscribed to Research Africa (www.research-africa.net), which is a comprehensive database for funding opportunities and research news in Africa. The PSC facilitates the access to Polytechnic researchers to this database.

Projects

The centre has responded to several research grant calls, involving mainly the Schools of Engineering, and Natural Resources and Tourism. It is important to note that the PSC has a facilitative function (linking institution with external funding agencies) and that all research is done through Schools. The following projects, have been granted and the funds have been made available to the schools:
School of Engineering: N$ 15,500,000

*Southern African Sustainable Energy Initiative (SASEI),* a collaboration with the National University of Lesotho, University of Botswana, Darmstadt University of Technology, Germany.
Funded by: EDULINK-EU, amount: N$ 6,558,000, duration: 42 months.

*Participatory Integrated Assessment of Energy Systems to Promote Energy Access and Efficiency (PARTICIPIA),* a collaboration with the Universitat Autónoma de Barcelona, Spain (applicant), University of Bergen, Norway, University of Stellenbosch, South Africa and the University of Botswana.
Funded by: EDULINK-EU, amount: N$ 3,398,000, duration: 36 months.

*Creating a Water and Environmental Innovation & Design Laboratory in Namibia,* a collaboration with the Lund University, Sweden.
Funded by: SIDA, amount: N$ 364,000, duration: 12 months.

*Maribia Project,* a collaboration with the SAMK University, Finland, NAMFI. Funded by: Finland, amount: N$ 5,180,000, duration: 36 months.

School of Natural Resources and Tourism: N$ 16,329,000

*Landscape Literacy,* a collaboration with the Integrated Rural Development and Nature Conservation (IRDNC) and Ecosystem Management Understanding (EMU), Australia.
Funded by: SASSCAL, Bundesministerium für Bildung und Forschung, Germany, amount: N$ 3,692,000, duration: 48 months.

*Impact of Land Use/Transformation (Bush Encroachment) on Water Resources,* a collaboration with the University of Hamburg, Germany and the University of Namibia.
Funded by: SASSCAL, Bundesministerium für Bildung und Forschung, Germany, amount: N$ 675,000, duration: 48 months.

*The Impacts of Fire on Biodiversity and Ecosystem Processes in Woodland Savanna,* a collaboration with the University of Hamburg, Germany and the University of Nebraska, USA.
Funded by: SASSCAL, Bundesministerium für Bildung und Forschung, Germany, amount: N$ 1,771,000, duration: 48 months.
Post Graduate Programme in Applied Science in Earth Observation, GIS and Remote Sensing, a collaboration with the CPUT, UNZA, NRSC, UB.
Funded by: SASSCAL, Bundesministerium für Bildung und Forschung, Germany, amount: N$ 5,571,000, duration: 48 months.

Forest Regeneration, Growth Rates, Threads and Trends in Different Forest Types, a collaboration with the Directorate of Forestry, Namibia, University of Botswana, University of Stellenbosch, South Africa.
Funded by: SASSCAL, Bundesministerium für Bildung und Forschung, Germany, amount: N$ 2,310,000, duration: 24 months.

Development of a National Forest Monitoring Programme, a collaboration with the MAWRD and the University of Trier, Germany.
Funded by: SASSCAL, Bundesministerium für Bildung und Forschung, Germany, amount: N$ 2,310,000, duration: 48 months.

Namibia Institute for Space Technology: N$ 48,000

Namibia Institute for Space Technology (NIST), a collaboration with the National Commission on Research, Science and Technology; Ministry of Education; University of Namibia.
Funded by: Ministry of Education, amount: N$ 48,000, duration: 24 months.

We would like to take the opportunity to sincerely thank our funding parties. Without them, research would not have been possible in the past, and will not be possible in the future.
Future Trends

When considering the future, it is often instructive to look at past history. The first phase of academic development of the Polytechnic was to introduce certificate and diploma programmes, in the place of the N-level qualifications it had inherited. The second phase involved development of curriculae that led to the offering of Bachelors of Technology degrees. It was during the third phase that the Polytechnic, in its Strategic Plan 3, that serious attention was given to the recurriculation of the Bachelor degrees as well as introduction of some postgraduate degrees. The latter necessitated the recruitment of staff at professor and associate professor levels, in order to build research capacity. Viewed against this backdrop of the Polytechnic’s beginnings as an undergraduate training institution, the research outcomes of 2012 consisted of 52 journal publications, 5 book chapters, 31 conference proceedings, 3 conference abstracts and 4 popular publications are reasonable. This is a promising platform for building research and development in the future.

The Polytechnic, like many other institutions that did not boast of an elaborate research record, faced all the challenges of associated with creating an enabling environment for research and development to flourish. At national level the National Council for Higher Education (NCHE) in its Strategic Plan, held the promise of introducing resources for staff development in higher education institutions, and for supporting research projects on a competitive basis. At institutional level, financial support for research projects, through the Institutional Research and Publication Committee (IRPC), already existed. The Research Strategy for the institution was been approved and a number of initiatives to upskill staff in writing of publications and supervision of research were instigated.

Given where research is at the moment, it is instructive to ask what the issues are that emerge from how the institution is pursuing the research endeavour? What are some of the ideas we might need to incorporate in order to improve research productivity? First, the Research Strategy of the institution prioritises research of applied nature; research should be aligned to national development goals; and it should address issues in our unique Southern African context. In general, what is positive is that the research carried out in 2012 meets all three Research Strategy requirements.

Second, while a number of Schools have been able to consolidate their research into clusters, others have yet to achieve this. As a result there are many individual projects, a situation indicative of a fragmented approach. In some of the instances where clusters have been formed, closer scrutiny reveals that in fact it is a potpourri of projects covered by a single umbrella. This approach misses the point that clustering is about promoting collaboration within a group, and also facilitates interdisciplinay and multidisciplinary approaches. This is what we need to work on as we go into the future.

At institutional level, we also need to find mechanisms for identifying a few strategic research niche areas, which are largely those areas that within a short time and with targeted funding have the potential and capacity to grow and draw international recognition of the Polytechnic. So the future is about consolidation, consolidation and consolidation of related research
areas. Interestingly, on examination of the research papers that have been published in good journals, it appears that most have been co-authored with researchers from other institutions. This demonstrates clearly the added value, derived from engaging in collaborative research.

Finally, what is needed to boost our research productivity? We need to revisit our recruitment strategy such that we do not only look for good teachers, but we also target talented scholars to enhance our research capacity. World-wide, universities encourage postgraduate students to drive the institutional research effort. To achieve this we therefore have to make fundamental changes to some of our practices. We will need increase the number of candidates for Masters’ students by ensuring that a greater number of students complete Honours programmes. Another key issue is the need to persuade students to do postgraduate studies on a full-time basis rather than part-time, because the latter approach cannot sustain a serious research endeavour.

The future outlook for research at the Polytechnic is bright, but it will require that all of us make the necessary adjustments in order to achieve the desired outcomes.
Conclusion

As an institution transforming into a university, the Polytechnic of Namibia has become evermore deeply engaged in applied research. It is our ambition to offer a unique range of top-tier research outputs, ranging from human sciences to management, health to natural and spatial sciences, and informatics to engineering. Indeed, this report offers clear confirmation that the Polytechnic of Namibia scientists have been involved in a number of very diverse research projects. Not only does this research report draw attention to some specific successful research activities and indicate the sort of research done at the Polytechnic in 2012, but it demonstrates the level of research achieved and serves to inspire the search for new knowledge.

Of note, the research outputs in 2012 were not only internationally accepted by way of publications and conference presentations, but were also of social and societal relevance. Although academics were constrained by almost insurmountable challenges, including budget cuts and heavy teaching workloads, a large number of them, right across the Polytechnic, contributed to the greater body of thought and knowledge in line with stipulated institutional niche areas. Polytechnic researchers made meaningful contributions to finding solutions for fundamental national issues and thus the Polytechnic’s reputation was considerably enhanced.

The Polytechnic's role is to recognise and support researchers by providing both material resources, such as seed funding and allocating work time, and intellectual resources that include seminar series and colloquia. Discussions on how best to utilise such resources have been initiated with several campus research leaders and are expected to extend well in 2013 and 2014 academic years.

Furthermore, this report indicates local, national and international support that has been received, such as NRF and many others, which made research activities successful and so contributed to Vision 2030. By recognising them as major contributors, this report has highlighted investment in research equipment, leveraging external funding, bringing in distinguished visitors, filling important academic vacancies and forming partnerships with internationally reputable institutions as important research anchors for the future.

I would like to add my thanks to all concerned.

Dr Andrew Niikondo
Vice-Rector, Academic Affairs & Research