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BURS VISION

Centre of excellence in revenue mobilisation and border mana

BURS

Enable the fa facilita man for the





MISSION

To conduct needs-based technology research that provides sustainable innovative solutions through co-creation and collaboration with local and international stakeholders.

VISION

To be the leading technology solutions provider that transforms lives.

Teamwork

We operate and innovate through teamwork, and although we expect individual expertise, the team performance takes priority. The value of innovation through teamwork includes behaviour such as valuing contribution, accepting diversity, pro-active approach, collaboration and co-creation.



Excellence

We expect and encourage unquestionable technical and operational excellence in planning, executing, monitoring and continuously improving everything we do.

Empathy

We interact, operate and generate solutions that optimally balance the interest of all stakeholders

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I'm honoured to narrate a few thoughts on the Foreword for the last newsletter for the year 2019, and on behalf of the BITRI Management, and staff.

This afford me an opportunity to give an overview of our successes and challenges as we endeavour to execute our mandate of identifying, developing and/or adapting appropriate technology solutions that provide sustainable innovative solutions. Our mandate calls for us to continually evolve to successfully adapt to the needs of Batswana, region and the global markets, and we have made some significant traction in that regard.

Kindly note that BITRI staff across all functions, demonstrated the commitment to BITRI delivering on its mandate. In the same spirit. I wish to commend the our parent ministry, being the Ministry of Tertiary Education, Research, Science and Technology, the BITRI Board of Directors and BITRI Management, for continuously striving to ensure a conducive environment for staff to spearhead the development of innovative and creative solutions to Botswana's challenges, and we lean on this continued support to enable BITRI to

contribute to the economic diversification of the country through technology innovations.

This year saw the organization make significant strides on several research and development projects, amongst them, air filters made for applications in industrial and surgical masks, Signcoach®, the Seding® solar street light, Kwibi, KSBB Technology, Nthusa mobile application and the Fleet Management System. These products are at various stages of piloting and commercialization, and it is our hope that our work will bear fruit when the concerned products provide relevant solutions to those intended for them.

In addition, BITRI has made notable inroads in accrediting facilities that serve the R&D needs of the organization, as well as external customers. This year, in April 2019 the BMS Testing facility attained accreditation under the revised version of ISO/IEC 17025 international standard from Southern African Development Community Accreditation Services (SADCAS) in the scopes of Civil Engineering and Mechanical Engineering. The Centre for Materials Science (CMS) is also in the process of attaining certification for its processes, which include and not limited to material characterization and fabrication.

The 3D Printing (Additive Manufacturing) laboratory is complete and has the capacity to enable direct manufacturing of complex geometries with ease, achieving therefore, a high degree of customization. The practical application of such solutions is unlimited, and we are excited about the ongoing development of the lab's capacity and capabilities and the possible offerings.

BITRI maintained and established collaborative relations for joint research and the optimal usage of large-scale research infrastructure at our organization. BITRI has positioned itself to be a catalyst in driving the R&D agenda on behalf of the Government and people of Botswana and ensuring that the country is highly-competitive on socio-economic development of its people. The media has also played a key role on conveying our messages to relevant stakeholders and the general public, and we humbly recognize their effort in that regard.

Thank you for your support in 2019, and we assure you of our commitment to our mandate in 2020 and beyond. Have a great and restful festive season.

Prof Shedden Masupe PhD, SMIEEE, Pr.Eng Chief Executive Officer



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BITRI Media Briefing

On Wednesday 20th November, Botswana Institute for Technology Research and Innovation (BITRI) hosted the media for the annual media brief at Maranyane House. BITRI Chief Executive Officer Professor Shedden Masupe gave an introduction and mandate of BITRI, the research focus areas, and an update on key projects under the focus areas.

Prof Masupe explained that BITRI conducted its midterm strategy review in February 2019 with an objective to take into cognizance the changes within the political, social, economic and technological environments within which BITRI exists since the formation of its first strategy in 2016, evaluate resource needs, amongst them human capital as well as corporate performance. Prof Masupe also appraised the media on the Kgalagadi Sand Building Block/Brick technology project, which BITRI is envisaged to set up twenty-nine (29) depots across the country by the end of the rollout phase. The CEO shared that the technology has been patented and that BITRI has licensed Kago Phepa Pty Ltd, a local company, to manufacture the KSBB blend and supply the depots.

"BITRI has come up with a technology for the manufacture of quality & affordable blocks/bricks using Kgalagadi sand as the aggregate & KSBB-specific cement blend as a binder. The KSBB Technology is patented & currently being rolled out throughout Botswana. To date there are five operational KSBB depots in Maubelo, Kasane, Lehututu, Phitshane-Molopo, and Takatokwane. An additional five are under construction and anticipated to be completed by end of this year at Artesia, Charles Hill, Ghanzi, Gumare & Maun," Prof Masupe elaborated.

Another project still under the Building Material Science division, is the investigation of the potential of local raw materials to produce portland cement clinker being done in collaboration with Botswana Geoscience Institute (BGI). The audience was informed that prospecting, sampling, qualitative & quantitative analysis of limestone and/ or calcrete deposits is on-going, and that prototyping clinker production will be informed by the fitness for purpose of the resources investigated with respect to quality and quantity.

Professor Masupe also made reference to declarations made by His Excellency Dr. Mokgweetsi Masisi during the recent State of Nation Address regarding the status of industrial masks being developed under the Nanomaterials division. The dust masks, made from nanofibers have shown to have a Viral Filtration



Efficiency (VFE) of over 99.9%, translating that the mask can filter out over 99.9% of viruses, therefore, opening doors for BITRI to expand its masks development to include protective health and medical masks to prevent viral infections, and deployment during outbreaks of epidemics.

"BITRI is also working on three main types of water filters; nylon nanofibre, ceramic and carbon-based filters for water purification. Filter cartridge made from Morupule Coal has been shown to remove odour from water; filter cartridge made from fly-ash has been shown to remove arsenic from water; and ceramic-based water filters developed at BITRI performed well in the lab, removing100% bacteria from water contaminated water;" explained Prof Masupe.

Prof Masupe updated on the various laboratories and facilities at BITRI such as the Centre for Materials Science (CMS), the Building Materials Testing laboratory, the 3D Printing (Additive Manufacturing) laboratory still under construction, as well as the Solar Thermal Testing Facility (STTF). In April 2019 The BMS Testing facility attained accreditation under the revised version of ISO/IEC 17025 international standard from Southern African Development Community Accreditation Services (SADCAS) in the in the scopes of Civil Engineering and Mechanical Engineering.

"The BITRI Building Materials Testing laboratory targets the Civil, Mechanical Engineering & Construction industries in Botswana & the SADC Region. It [the laboratory] has been accredited for two testing methods; Civil Engineering for Compressive Strength testing, and Mechanical Engineering for Tensile Strength testing. In addition, the laboratory has the competence to carry out Concrete Testing, Aggregate Testing, Cement Testing and Metal Testing," Prof Masupe explained.



"BITRI is also in the process of attaining accreditation for the CMS facilities with the SADCAS. Currently most of the testing jobs done by the mining, water distribution and built environment enterprises are done in South Africa. So, we are hopeful of benefiting from those transactions once our labs are accredited," enthused Prof Masupe.

Prof Masupe also spoke on the Climate Smart Agriculture Lessons Learnt manual developed as a result of a partnership of BITRI with the Ministry of Agricultural Development and Food Security and the United Nations Development Programme (UNDP) Botswana. The manual developed in conjunction with farmers, aims to the use of climate smart technologies to increase productivity and farmers' resilience, and has already borne fruit in the test areas, with more small-scale farmers adopting the manual based on experiences of their contemporaries. BITRI was said to also be the lead author in the drafting of Botswana Drought Management Strategy, which the final draft of which will be used as the principal strategy to guide the Government of Botswana interventions regarding drought management.





Under the Technologies broad thematic area, the CEO updated on the Sign Coach application aimed at bridging the gap between the hearing and non-hearing by teaching Botswana sign language in 3 levels from beginner up to advanced level. The application was developed in partnership with the Botswana Society for the Deaf (BSD) and serves to share information on among others, HIV/AIDS, non-communicable diseases (NCDs), sexually transmitted diseases, drug abuse, circumcision and pregnancy.

The other significant project is the Kwibi, a wildlife mobile application used for online sightings, posting location finder, and recordal of incidents, analysis and reporting for which BITRI and a local company, Fox Croft Pty Ltd, entered into a Computer Software License Agreement for the application earlier in November.

The other projects are the Nthusa Distress Call software suite used by the public to send distress messages to police, emergency, and fire services to request for assistance, the Fleet Management System that keeps track of a vehicle's life cycle, produces reports, gate logs, trip calendar, inventory management, accident & process requests and performs other functions such as car Tracking, Geo-fencing, Speed limit & Ignition Status. The CEO reported that the installation of the Seding Solar street light is ongoing, with the lights functioning properly in test sites in Moshupa, Lobatse and Letlhakane. Regarding the Biogas project developed in collaboration between BITRI and UNDP, with the objective to facilitate low-carbon investments and public-private partnerships in the production and utilization of biogas from agro-waste, the CEO appraised the audience that the project is predominantly being adopted in the districts in Southeastern Botswana. At the time of reporting, twenty (26) digesters were said to have been built and operating in areas such as Moshupa, Kanye and Tlokweng, and a corresponding number of masons having been trained on small scale biogas digester construction, operation and maintenance.

The media brief concluded with a tour of the 3D laboratory led the BITRI Design Engineer, Shorn Molokwane. Mr. explained the advantages 3D has in comparison to the traditional manufacturing process, highlighting, the former's capacity to enable direct manufacturing of complex geometries with ease, achieving therefore, a high degree of customization. This quality, Mr. Molokwane added, makes 3D printing ideally suited for patient-specific medical device applications, as well as combining of multiple parts and producing assemblies as single units. The laboratory currently does 3D printing using plastic, and will in near the future, install



equipment that allows for application using metal. When expounding on real-life application and relevance of the technology, Mr. Molokwane cited the manufacturing of patient-specific implants such as the printing of mangled bones that conform to the bodies of recipients. The parts manufactured using the technology, can replace the original body parts and restore the quality of life of recipients.

In her Closing Remarks, the BITRI Director Research and Partnerships, Dr. Bathsheba Mbongwe, expressed

gratitude towards the media and put into the context, the role of BITRI of achieving the strategic goals set by the Government of Botswana.

"In making the closing remarks, on behalf of the Board, the CEO and Management, we would like to sincerely thank the media for gracing this occasion. We regard the media as our bridge to access the public so that they are made aware of what is happening at BITRI. Innovation is the current and future currency of global competitiveness. For any nation to grow, and be competitive, it needs to be very innovative, and BITRI

> has begun strides in developing different technologies. And for us, innovation is not only about creating technologies; it is also about disseminating information and adapting or adopting existing technologies. And that is what we are doing today – disseminating information on what we are working on. I am saying this because when you look into our [Botswana] aspirations, as articulated in Vision 2036, it indicates that we would like to become a high-income country through an export-led economy. And one of the strategies that the country has adopted, is that we will achieve that high-income country status, though a knowledge-based economy, where research and innovation play a critical role. BITRI is already on that pathway to achieve the vision of our country. And when it comes to

global rankings in relation to global competitiveness, the rankings will improve because of the work that is being done at BITRI. We really value our partnership with the media, that we have nurtured over the years. We believe that, for those who will ask what BITRI does, since there is general lack of understanding around science and technology matters, you [the media] will be our voice in conveying the message on what our organization does,'' said Dr. Mbongwe.

BITRI SIGNS MOU WITH BURS



BITRI signed a Memorandum of Understanding (MoU) with the Botswana Unified Revenue Service (BURS) this morning. The purpose of the MoU is to provide a basis for collaboration towards the fulfilment of the respective mandates of the two parties by engaging in collaborative projects. The Acting Commissioner General Mr Segolo Lekau hailed the day as historic and said it was long overdue. He noted that strategic collaborations with such organisations as BITRI are important because they create a platform to learn from each other and exchange ideas. He noted that BURS have a challenge with Batswana filing their tax returns on-line and hoped that BITRI would assist in this regard.

Mr Lekau also talked about a project with BITRI in the Chobe District where they had requested for assistance with bat infestation in their offices. Even though the technology installed has not achieved the objective he said he believed that all is not lost as the technology could still be improved. He said the aim is to chase the bats away and avoid killing them. He said another area of potential collaboration is solar lighting in some of their offices that are facing electricity challenges. Mr Lekau also pointed out that as BURS they are thinking of coming up with a research and development arm, noting that it could also be a potential collaboration area.

In response the BITRI CEO Prof. Masupe congratulated BURS for a job well done in terms of e-tax filing but pointed out that towards the end of the tax filing season BURS switch boards are inundated with calls from clients who enquire about various issues. In this regard Prof. Masupe recommended the BITRI BOT, a technology that can answer the queries, thus relieving the switchboards. He said one area that BITRI has capacity in is data analytics which could help to determine how Botswana as a country is doing. Other projects Prof Masupe mentioned included the BITRI nanofiber material for protective clothing as well as the fleet management System. Prof Masupe said BITRI as a government arm would be happy if other government arms consult with them when in need of technology solutions instead of procuring expensive technologies from outside the country.



BITRI and FoxCroft Sign Software Licence Agreement

BITRI recently hosted FoxCroft (Pty) Ltd, a locally-incorporated company, for a Computer Software Licence Agreement signing ceremony.

This Agreement relates to the iNtsu (Kwibi), a wildlife mobile application used for online sightings, posting location finder, and recordal of incidents and analysis and reporting developed through the collaboration of BITRI and Fox Croft.

BITRI Chief Executive Officer Prof Shedden Masupe, signed the Agreement on behalf of the organisation, and the FoxCroft (Pty) Ltd CEO, Ms Hughes signed on behalf of her company.

The two Parties entered into a Non-Disclosure Agreement in January 2017 for the purpose of collaborating on the development of mobile applications for the tourism sector and subsequently entered into a Project Specific Agreement for the purpose of collaborating on the development, testing and commercialisation of the application in February 2017.

BITRI extends its appreciation to the media houses that honoured the invitation.





BITRI HOSTS WAITRO *Networking Session*

Botswana Institute for Technology Research and Innovation (BITRI) and the World Association of Industrial and Technological Research Organizations (WAITRO) Secretariat held a networking session on Tuesday 5th November at BITRI Maranyane House in Gaborone.

The purpose of the networking session was to bring together universities and research institutions to learn about the mandate of WAITRO and further explore opportunities on becoming members to the organization. WAITRO further shared on the WAITRO's Open Innovation Hub SAIRA, a platform established to foster international collaboration in research and development and to tackle the United Nations' Sustainable Development Goals by linking researchers together with companies, start-ups, NGOs, government agencies, and impact investors in order to transfer technologies and implement innovative solutions on a global scale.

The networking session provided grounds for fruitful discussions to further deepen the ties among WAITRO members and relevant stakeholders in Botswana and the region. Key stakeholders in the research development and innovation arena attended the afternoon session.

WAITRO, consequently convened its 83rd Board and 24th Regional Focal Point (RFP) Meeting in Kasane, Botswana, on 6th and 7th November 2019.









BITRI Hosts the Open Innovation Challenge Innovators from Tourism and Agriculture Sectors

From 4th – 6th of November, Botswana Institute for Technology Research and Innovation (BITRI) and its partner, **Research Institute for Innovation** and Sustainability (RIIS), conducted an intensive 3-day training targeting innovators who had responded to the Tourism and Agriculture Challenges under the Open Innovation Challenge. The aim of the Challenge is to use the innovation ecosystem as a mechanism to empower entrepreneurs to solve pressing needs in the Health, Agricultural, Education and Tourism (HEAT) sectors in the SADC region, and is fully-sponsored by the Southern African Innovation Support (SAiS).

The main purpose of the training was to empower the thirteen (13) start-ups with key business principles which hinged on the design thinking process. The training also included marketing, financial analysis, pitching and overall proposal structuring. All the entrants had submitted their proposals to the Agriculture Challenge, in response to the question "How might we enhance future food security for people in Southern Africa."The entrants had to create solutions in the current problem areas covering Building an Effective Supply Chain, Mitigating Risk of Climate Change. Human Wildlife Conflict and Agricultural Technology Adoption. These innovators were also competing with other start-ups in the SADC region, who had submitted their pitches online.

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On the last day of the training workshop, the Agriculture start-ups pitched their innovative solutions to a panel of three judges and ultimately three start-ups, being Bio-Watt, which focused on production of biomass charcoal and briquettes from organic waste, Green Aspects whose solution was on Sustainable Agriculture Technology, and Mash Mod. Manufacturing, who proposed production of Natural (Organic) Pesticides were chosen as the best, in that order.

The next phase of the challenge is to incubate the winners at BITRI for a period of three (3) months. When making the closing remarks at the end of the training, the Executive Director – Natural Resources Prof. Asare Nkansah, explained that the incubation will be more technical and delivered through mentoring and coaching. Prof. Nkansah further stated that a contractual agreement signed with the participants prior to commencement of incubation stage, and he encouraged those who were unsuccessful, to peruse their ideas further and improve them given the feedback received during training. The incubation stage is expected to begin in January 2020.

Professor Sesae Mpuchane addresses graduates at the UB's 37th Graduation Ceremony

The BITRI Board Chairperson and former Head of the Department of Biological Sciences and Dean of the Faculty of Science at the University of Botswana, Professor Sesae Mpuchane delivered a motivation-laden address to graduates during UB's 37th Graduation Ceremony. The speech, leaning on the theme for the graduation, "Education for economic diversification: Towards the Fourth Industrial Revolution" enlightened the graduates on the skills, requirements as well as the challenges of the job market and various industries they soon would be part, on the domestic and global fronts.

Speaking at the Science, Medicine, Health Sciences, Engineering and Technology faculties graduation ceremony on Friday 11th October, Prof Mpuchane said, "We are stepping into the fourth industrial revolution at a time when our physical and technological environments are going through major changes. The impacts of climate change, for instance, are threatening our livelihood in many ways. Advances in technology are presenting numerous solutions and challenges depending on one's vantage point. There is a greater demand that we fully participate in guality education to serve as a sound foundation for research and innovation that will come up with meaningful solutions that will take us to a level never dreamt about before. We need to provide a conducive technology driven environment in our institutions of learning and innovation in order to thrive and to diversify the economy."

Prof Mpuchane encouraged graduates to be ready to translate their education output into useful products and aid the nation to thrive under opportunities and challenges presented by the Fourth Industrial Revolution (4IR). She further challenged those who develop curricula across the different levels of education, to do so in the context of present and future needs, and for the curricula to serve the country's research and development needs. Prof Mpuchane added that, though there is low penetration of internet,



and use of some digital platforms, the youth are more digitally literate and are ripe to Science, Technology, Engineering, and Mathematics (STEM) to develop pertinent solutions and enhance the country's global competitiveness and output.

"You are completing at a very challenging but exciting time. At the same time, many experienced personnel are reaching retirement age. The challenge is that unless the new graduates have appropriate skills, a wave of retirements could result in companies' decline in revenue, increased product costs and reduced design efficiency. This is happening at a time when most companies need to expand and change focus in keeping with the requirements of the 4IR. Companies are therefore more stringent in their hiring of personnel with the right skills or, who can easily be trained quickly to upgrade their capabilities. Employers are looking for talent, for graduates who have gone through programmes that emphasize applying technology to solving problems, the right curriculum that involves industry in its design and programmes that emphasize team-based projects," Prof Mpuchane elaborated, Prof Mpuchane further advised the 544 graduates to be adaptable to achieve success in an everchanging environment.

The UB graduation ceremony, convened for the 37th time, was held at the university's Indoor Sports Centre, and was attended by a number of dignitaries among them, His Excellency, the President of the Republic of Botswana, Dr Mokgweetsi Eric Keabetswe Masisi, Cabinet Ministers, members of Diplomatic Corps, leaders of corporate entities, guests, parents and well-wishers. Twentyfour (24) students graduated with PhDs, three hundred and fifty with (350) MPhil, Masters and Postgraduate Diplomas, one thousand eight hundred and twenty-one (1 821) with Degrees, while two hundred and fifty-nine (259) were conferred Diplomas. 2019 saw the university holding three separate graduation ceremonies, with two of those held on 10th October for the Business and Social Sciences and faculties of Education and Humanities graduates.



BITRI LAUNCHES THE TECHNOLOGY AND INNOVATION SUPPORT CENTRE (TISC) OFFICE







BITRI, recently hosted a ceremony to mark the establishment of the Technology and Innovation Support Centre (TISC) office at the institution.TISC is a project sponsored by the World Intellectual Property Organization (WIPO) to facilitate access and retrieval of scientific information from patent and scientific journals at low cost. TISCs serve to reduce the knowledge gap between the developed and the developing countries, strengthen the local technological base by building up local knowhow, increase technology transfer (for example, by investigating the possibilities of licensing technologies in or forming joint ventures), as well as assist Researchers and Inventors to create, protect, own and manage their intellectual property rights.

The TISC office will serve local individual inventors, Small and Medium Enterprises, big corporations, as well as Researchers in technology organizations and universities. Other benefits of TISC include technology monitoring, identification and adaptation of appropriate technology solutions to improve the quality of life of people in developing countries.

The Companies and Intellectual Property Authority (CIPA), Botswana Innovation Hub (BIH) and Department of Research, Science and Technology (DRST), being some of the key stakeholders in the research and development and innovation ecosystem, were also represented at the event.

Still during the event, some of the BITRI staff across the different levels of operations, were awarded certificates after completing different levels of Intellectual Property courses.

What services does the TISC office offer to innovators?

- Patent information searches
- Scientific and technical literature searches
- Advisory services on intellectual property, technology transfer, innovation and commercialization
- Technology monitoring

To find out more information, use the contact details below:

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BITRI HOSTS INNOVATION EXPERT FOR COLLABORATION DISCUSSIONS

This week, BITRI hosted Ms. Inger Danilda, a Swedish and EU expert in entrepreneurship, innovation, cluster and SME development as well as a global expert in innovation & gender. Ms. Inger Danilda is in Botswana on a scoping mission to investigate potential projects that could be incubated through test beds in two or three settlements in Botswana. Botswana is earmarked to be part of the countries in Southern African Development Community (SADC) in which such projects will be tested, the other countries being South Africa and Tanzania.

The visit also explored identification of societal challenges that BITRI could address through its mandate to provide technology solutions in partnership with society. In this regard, the themes of Climate Change and digital solutions are high on the agenda, and the respective Executive Directors and Lead Researchers presented on the mandates of their functions and also initiated discussions around possible areas of collaboration. The outcome of the meeting was that more engagements will ensue, with possibilities of collaboration in the future.

Background

Ms. Inger Danilda provides advice for the Swedish Innovation Agency, Vinnova, the European Commission and other organisations, and has interest in local and regional development processes related to entrepreneurship and innovation across all sectors, with a specific interest in agricultural and food value chain innovation, gendered frugal innovations and crossclustering agribusiness. In the latter area, she has been involved in EU member states such as Portugal, Spain, Greece, Italy, France and Poland, but also, in Brazil. Ms. Danilda came to Botswana, en route from South Africa, and she has already met with various organisations, individuals and experts - and has planned engagements with farming, gender, development, innovation and research actors to discuss project ideas and modalities for collaboration. She hopes to identify potential projects (or ideas) which can add value through incubation or partnerships.



TECHNOLOGY solutions that provide **SUSTAINABLE** Innovative Solutions

