

Directorate of Innovation, Technology
Transfer and Commercialisation



***Technologies:
Opportunities for
Commercialisation***

Define tomorrow.

UNISA | 
university
of south africa



PROF THENJIWE MEYIWA

Vice-Principal: Research, Postgraduate Studies, Innovation and Commercialisation

Through this publication we assert that higher education, science, technology and innovation have a dynamic link with economic growth and prosperity. Unisa's innovative research starkly reflects this nexus. The bigger the ship, the harder it is to turn around, the saying goes. Unisa is certainly a massive and complex institution, but it can be agile and proactive when required. These qualities are indeed called for at this juncture of Africa's evolution, where long-entrenched socioeconomic inequalities have more recently been compounded by a global health emergency.

Unisa's response has been to align its research and innovation endeavours ever more closely with the United Nations' 2030 Agenda for Sustainable Development and the 17 sustainable development goals (SDGs) and, in South Africa, with the National Development Plan (NDP) 2030. In so doing, we seek to ensure that the intellectual talents of our researchers and inventors are not used to serve narrow institutional or professional interests, but to support the greater good.

With the SDGs and NDP guiding us, we are focused on doing the kind of research that really matters, as is clear from the breadth and depth of the energy, water, ICT (information and communication technology) and manufacturing solutions described in this booklet. We constantly remind ourselves that the innovations we generate should contribute towards shaping a better, safer, more sustainable future for all South Africans, the African continent and humanity as a whole. When our researchers explore innovative energy solutions, for instance, they are not just building a new solar or wind turbine system for household use – they are ensuring "access to affordable, reliable, sustainable and modern energy for all" (SDG 7).

This outward-looking focus is a pillar of our research and innovation strategy, and is important because it reflects an awareness of innovation not merely for its own sake, but for the competitiveness of our country and the growth prospects of our continent.

Of course, we are proud that Unisa ranks among South Africa's top ten public universities in terms of overall research output, and naturally we enjoy the fact that our portfolio of technologies is growing in leaps and bounds. Most of all, though, we take pleasure in the knowledge that what we do is relevant to many people's lives, livelihoods and quality of life.



PROF LES LABUSCHAGNE

Executive Director: Research, Innovation and Commercialisation

In this era of ubiquitous communications connectivity, it would be easy to conflate technology with the always-on connected experience that is increasingly shaping the lives and work of 21st-century human beings. As we transition into the Fourth Industrial Revolution (4IR), the rules of business, education, government and life in general, are changing. Emerging technologies are creating new opportunities for more people than ever before. Certainly, the Internet of Things underpins virtually everything we do today, including our research and teaching activities, but confining our view of technology to the developments of the past two decades, does not do justice to the term. While the Third Industrial Revolution laid the foundation for what is available today, we have a responsibility to move forward and build on it.

The idea of technology as progress aligns closely with the vision of Unisa, which is to be the African university shaping futures in the service of humanity. This bold, broad and ambitious vision is essentially about making progress in tackling the challenges facing continents, nations and ordinary citizens alike. The Covid-19 pandemic has proven that an overreliance on government to deal with such challenges, is problematic. Rather, it is collaboration among government entities, business, the higher education sector and communities that can and will yield the best results.

The challenges facing Africa (and more specifically South Africa) serve as a launching pad for progress unlike anything we have witnessed before – progress that harnesses the innovative culture and spirit of many brilliant minds who are ready to create solutions from which many people can benefit. It is the responsibility of universities such as Unisa to facilitate the development of this culture and to nurture it.

The university prides itself on the tremendous progress that has been made in developing an innovative culture among its employees and students. The small yet highly motivated and talented team in the Directorate: Innovation, Technology Transfer and Commercialisation took on the task in 2012, and has made significant strides ever since. The results speak for themselves: signs of progress are everywhere.



MR AYANDA V. NOMA

Director: Innovation, Technology Transfer and Commercialisation

Great innovators do not wait for the right circumstances, the perfect moment or the ideal opportunity. They use whatever is available to them at the particular time, to set the wheels of innovation in motion. Such people know that nothing is more important than making a start, no matter how small that start might seem at the time.

When the Directorate of Innovation, Technology Transfer and Commercialisation (DITTC) started out not so long ago, it seemed the steps we were taking were too insignificant to add up to anything. Yet one step led to another and yet another, and before we knew it, we were taking enormous strides in establishing an innovation and technology transfer endeavour of which we can rightly be proud.

As this booklet shows, innovation and technology transfer are achieving growing traction among staff and students. More and more people are beginning to appreciate and understand the importance of these concepts, in enhancing the impact that the university's research and development can have on society at large.

Research and innovation are drivers of economic growth and restructuring, as well as social wellbeing. There are ample examples of countries that have harnessed innovations to create new capabilities and competencies which have launched them onto unforeseen and steeper growth trajectories. South Africa can do it too. We have an engaged and enabled national system of innovation and knowledge-generating infrastructure, aligned to deliver on the national objective of transforming this country into a knowledge-driven economy.

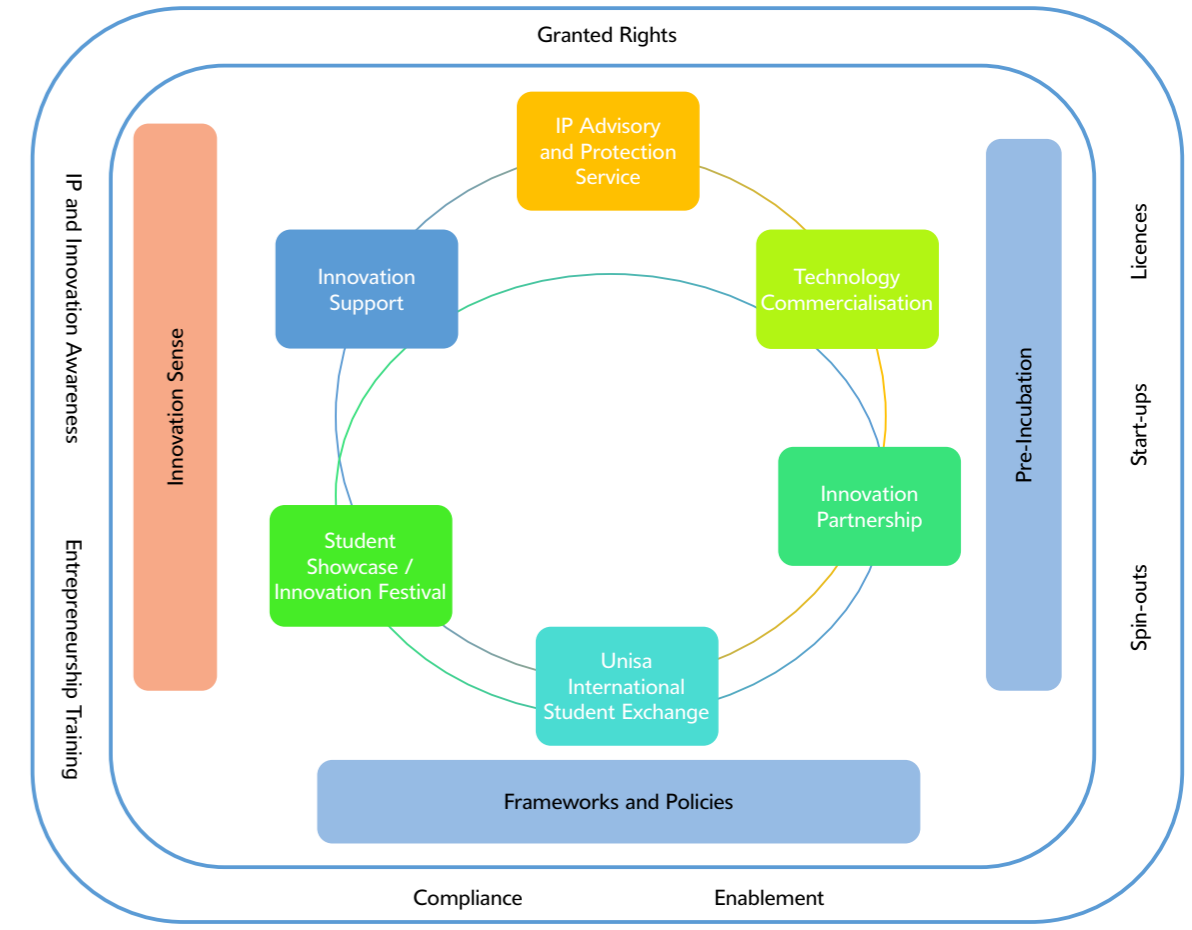
As part of the knowledge-generating infrastructure, universities are well placed to help drive the knowledge economy and the Fourth Industrial Revolution agenda in a quest to solve many of the societal challenges confronting our country and the continent.

Within universities, offices of technology transfer (OTTs) are vital cogs in setting and keeping the wheels of progress in motion. They serve as their institutions' links with the larger national and regional innovation ecosystem, constantly bringing fresh insights and new resources into each organisation, while taking its innovations out into the public domain, ultimately as commercially viable, marketable solutions.

The DITTC, with its array of support mechanisms and instruments (including pre-incubation and incubation structures), forms part of concerted efforts to build the viable, vibrant, learning institutional innovation ecosystem that is so crucial for ensuring successful outcomes for Unisa's innovation and technology transfer activities. The wheels are in motion; the destination is clear and the momentum unstoppable.

What follows is a list of technologies which have been developed by Unisa staff and students. We are looking for partners who can help us take these exciting innovations to the marketplace.

The role of the DITTC





DISRUPTIVE TECHNOLOGIES
TYPICALLY ENABLE NEW MARKETS
TO EMERGE.

- CLAYTON M. CHRISTENSEN, *THE INNOVATOR'S DILEMMA: WHEN NEW
TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL*



Technology offerings

Energy  Pages 8-19

Pages 20-33  Water

ICT  Pages 34-47

Pages 48-57  Manufacturing



ENSURE ACCESS TO AFFORDABLE,
RELIABLE, SUSTAINABLE AND
MODERN ENERGY FOR ALL.

- UNITED NATIONS SUSTAINABLE DEVELOPMENT GOAL 7



ENERGY

Effective Heat Removal in Tubular Fixed-Bed Reactors

Technology

The technology relates to an upright tubular fixed-bed reactor body comprising a heat-dissipating pipe, which extends from the reactor tube wall, to ensure that heat is effectively transferred in highly exothermic reactors such as Fischer-Tropsch, which are prone to heat build-up. The heat pipe is developed using a metallic, elongated, hermetically sealed tube, which provides robust air control. Furthermore, the reactor comprises a cooling section, to cool the first heat-removal medium – when the first heat removal is circulated in the wall shell of the reactor – to ensure effective temperature control during chemical reactions.

Market need

Temperature control is a key component in the synthesis of chemical substances. Current designs for removing heat in fixed-bed reactors are, however, not effective, and this affects chemical reactions. Ineffective heat extraction may result in the development of hotspots within the reactor, which deteriorate the capacity of the catalyst material, thus compromising the rate of chemical reaction. Moreover, ineffective heat extraction leads to the deactivation of catalysts, thereby reducing the lifespan of the catalysts, demanding revision and continual replacement which, in turn, lead to increased operational costs that are highly dependent on energy input, energy removal and raw material costs, amongst others.



Features

- Two-way path heat dissipation
- Elongated hermetically sealed heat pipe for heat removal
- Each heat pipe has two zones (cooling and heating)



Benefits

- Effective heat transfer – no heat build-up
- Improved reaction rates and overall productivity
- Prolonged lifespan of catalyst
- Effective temperature and pressure control



Industry

Energy

Creators

D Glasser, X Lu & D Hildebrandt

Stage of development

Prototype

Intellectual property

Pending Patent Applications (ARIPO, Europe, China, USA & SA), Granted Patent (Australia)

Desired relationship

Co-development partner, investor

Low-Cost Household Wind Turbine

Technology

The invention relates to a low-cost, portable, self-aligning rooftop wind turbine designed to capture moderate-velocity wind and generate electricity efficiently for household use. Current large-scale wind turbines in South Africa are located far field and the energy generated must be transported back to communities by using huge power lines – something which increases the cost of energy delivery. The portable, self-aligning low-cost wind turbine comprises a small-radius innovative blade system to ensure maximum torque per small rotating radius. It uses extremely low-cost components, is portable and can be installed with ease, as an add-on to any premises. The cost of purchasing these systems can be as low as R5 000. The energy generated from the system is transported directly into the household system via an innovative electronic controller box fitted directly to the distribution box at the home.

Market need

The wind energy potential in South Africa is estimated at 67 000 GW, however, only 3 GW of wind energy installation is estimated by 2020. One of the contributing factors to this low penetration is that much of the focus in wind turbine technology has been on utility-scale wind farms. While these play a significant role in alternative energy generation, there continues to be a huge potential for rooftop wind turbines for household use. The development of technology targeted towards low-cost household wind turbines will greatly contribute to the success of wind energy technology in South Africa and on the African continent.



Features

- No tail blade and self-aligning mechanism
- Small rotating radius with maximised torque and wind-capture area
- Self-regulating with regard to rotation speed
- Micro-controller power extraction and control



Benefits

- Extremely low cost and simple production
- Low cost and affordable for small and medium households
- No or less dependency on grid electricity
- Suitable for application in smaller households as well as on custom-designed urban wind farms



Industry

Energy

Creator

Lukas Snyman

Stage of development

Prototype

Intellectual property

Pending Patent Application (SA)

Desired relationship

Co-development partner, investor

Solar Energy Harvesting System

Technology

The technology relates to a system which harvests thermal energy from various sources (e.g., sunlight, cars, power plants, factories and other industries) and converts it into electricity. In this system, heat energy is harvested and then stored in a storage tank, using water as energy storage medium. Hereafter, it flows along a gradient to an energy radiator, and converts a portion of the thermal energy into electrical energy through a special semiconductor array device. To ensure maximum harvesting and conversion efficiency, the system runs cycles both during day- and night-time, creating a continuous supply of electricity to household appliances.

Market need

Although photovoltaic (PV) technology supports global energy demand and the quest for low carbon emission technology, the cost of PV technology is still high (R2.50 per kWhr over 10 years), and the efficiencies of commercially available systems remain low (approximately 10%). Energy is also stored in expensive high-technology battery systems, while PV cells are only active during peak solar irradiation hours during daytime.

Thermal energy harvesting systems, however, are much more efficient when it comes to collection (approx. 90%), they can be stored easily in water and are extremely cost-effective and environmentally friendly. Our developed system can harvest and store thermal energy at extremely low cost (R0.10 per kWhr). The stored heat is used for supplying hot water in household applications, while about 30% of the harvested thermal energy can be converted to electricity through specially developed semiconductor and electronics control technology. The cost of production of such systems can be realised for as little as R0.50 per kWhr over ten years.



Features

- ⚙ Thermal energy is harvested from solar and other available thermal energy sources
- ⚙ Thermal energy is effectively stored in special systems
- ⚙ Continuous conversion cycle to electricity



Benefits

- ⚙ Extremely cost effective and sustainable
- ⚙ Continuous electricity supply
- ⚙ Environmentally friendly
- ⚙ Limited moving parts extend lifetime of systems
- ⚙ Scaled systems are possible, to supply all the energy needs of a household



Industry

Energy

Creator

Lukas Snyman

Stage of development

Prototype

Intellectual property

Pending Patent Application (SA)

Desired relationship

Co-development partner, investor

Plastic-to-Energy Anaerobic Gasification

Technology

The invention relates to an energy-generating system that makes use of polyethylene plastics (that would otherwise result in environmental pollution) to produce synthesis gas (syngas). Unlike conventional gasification systems that rely on oxygen, this system ensures that the gasification of polyethylene to generate syngas takes place in an anaerobic state, therefore completely removing the air separation step, which significantly lowers energy costs. A novel feature of this system is its ability to recover a portion of the latent heat of water, allowing for a significant improvement in energy production over more conventional designs. This system turns non-recycled plastics into power, converting a harmful waste material into something useful.

Market need

Due to low production costs and flexible material properties, plastic finds application in multiple areas. The disposal of plastics without land filling remains an environmental concern, however, as plastic does not decompose. With the expected improvement in standards of living, the global production of plastic is also expected to grow. Gasification can help with the management of plastic disposal processes, while ensuring energy generation.



Features

- ⚙ Anaerobic gasification
- ⚙ Recovery of latent heat
- ⚙ Polyethylene plastic feedstock



Benefits

- ⚙ Higher energy production and a simplified gasification process
- ⚙ Low energy costs
- ⚙ Efficient method of plastic waste disposal



Industry

Energy

Creator

James Fox

Stage of development

Prototype

Intellectual property

Provisional Patent Application (SA)

Desired relationship

Co-development partner, investor

High-Performance Lithium Ion Batteries

Technology

The technology relates to a sol-gel-based, uniform carbon-coating method for producing high-performance lithium-ion batteries. This method makes use of organic phosphoric acid as carbon and phosphoric sources to produce uniformly carbon-coated lithium-ion batteries that overcome the challenges of low capacity and low energy density that ultimately result in battery failure. This method allows the manufacture of batteries that can be used in applications requiring a long life cycle and significant safety.

Market need

Lithium is the preferred material for developing smaller, lighter batteries. Currently, it is largely used for recharging batteries used in electronic devices such as mobile phones, digital cameras and power tools. As a result, lithium-ion batteries have become the more sought-after alternative to nickel batteries, for use in recharging hybrid and electronic vehicles, as well as energy storage. In responding to the need for energy security, the scarcity of fossil fuels and concerns regarding global warming, the move towards hybrid and electric vehicles has led manufacturers to seek to improve the existing technology of lithium-ion batteries, in order to develop more lightweight and efficient batteries that offer greater travelling distances between vehicle charges. Lithium-ion batteries offer higher performance and higher charge rates, all at a much lower cost.



Features

- ⚙ Stable iron source
- ⚙ Use of cost-effective material



Benefits

- ⚙ High performance
- ⚙ Increased capacity



Industry

Energy

Creators

X Liu, Z-Y Yuan & M Chen

Stage of development

Prototype

Intellectual property

Pending Patent Applications (Europe, SA, USA & China, Germany & South Korea)

Desired relationship

Co-development partner, investor



ENSURE ACCESS TO
AFFORDABLE, RELIABLE,
SUSTAINABLE AND MODERN
ENERGY FOR ALL.

- UNITED NATIONS SUSTAINABLE DEVELOPMENT GOAL 7



WATER

Membrane Distillation for Desalination

Technology

The invention relates to the design of a robust membrane for desalination, using membrane distillation (MD). Although MD technology has advanced over the years, its industrial application for the treatment of brackish water and seawater continues to lag behind. This invention exhibits advantages over well-known pressure-driven membrane processes, as desalination is achieved by operating at low temperature and low pressure, with less membrane fouling. This membrane is designed with a unique structural morphology, with high hydrophobicity and porosity that allow the membranes to achieve up to 80% water recovery. The membranes are resistant to fouling, thus ensuring long-term operation without significant performance deterioration. This reduces the cost associated with replacing membranes.

Market need

While measures such as water conservation, repairing of infrastructure, and catchment and distribution processes have been put in place to address water shortages, existing water sources seem to present a viable long-term solution, as they can increase the sources from which water can be obtained. This membrane therefore presents a wide range of solutions in the treatment of seawater, with desalination processes providing opportunities for producing large quantities of clean water.



Features

- ⚙ Membrane with a superhydrophobic and superoleophilic mechanism
Membrane is developed using waste-expanded polystyrene
- ⚙ Membranes can be used multiple times before being replaced



Benefits

- ⚙ Efficient crude oil removal from water
- ⚙ Crude oil recovery from membrane regeneration Environmentally friendly process
- ⚙ Cost-effective manufacturing of membrane
- ⚙ Cost-effective recovery process



Industry

Water

Creators

Edgar Mapunda, Titus Msagati and Bhekie Mamba

Stage of development

Prototype

Intellectual property

Provisional Patent Application (SA)

Desired relationship

Co-development partner, investor

Recovery of Spilled Crude Oil from Water

Technology

The invention relates to a membrane technology developed using polymeric material, to recover crude oil found in water due to spillages. Although several techniques have been employed for removing crude oil from bodies of water, these techniques are either focused on dissolving the spilled oil (rendering it useless) or using multiple processes to adsorb and recover the oil. This membrane technology presents an affordable solution for recovering spilled crude oil from water, without dissolving the oil or leaving behind a superhydrophobic membrane soaked with oil in the water. The membrane ensures that the spilled oil is effectively removed from the water and that the oil is recovered for further processing, leading to a reuse of the membrane.

Market need

Oil spills remain a challenge in the oil industry, resulting in far-reaching damage to economies and the environment. It is estimated that approximately 706 million gallons of waste oil enter the ocean annually. Therefore, any spillage or inefficiency in the removal of spilled oil entails economic loss and, possibly, environmental problems. The need remains to develop affordable membranes with effective and large absorption capacity, good selectivity, reusability, high oil recovery nature and insolubility in water. Furthermore, due to the valuable nature of crude oil, it is important to develop membrane technologies which are capable of recovering oil from the membrane, for reuse.



Features

- ⚙ Membrane with a superhydrophobic and superoleophilic mechanism
- ⚙ Membrane is developed using waste expanded polystyrene
- ⚙ Membranes can be used multiple times before being replaced



Benefits

- ⚙ Efficient crude oil removal from water
- ⚙ Crude oil recovery from membrane
- ⚙ Membrane regeneration
- ⚙ Environmentally friendly process
- ⚙ Cost effective manufacturing of membrane
- ⚙ Cost effective recovery process



Industry

Water

Creators

S. Alayande, E. Dare, T. Msagati, A. Akinlabi & P. Aiyedun

Stage of development

Prototype

Intellectual property

Pending Patent Applications - SA, USA, India, Brazil, Europe, China, ARIPO & Canada

Desired relationship

Co-development partner, investor

Acid Mine Drainage using Maghemite Nanoparticles

Technology

The invention relates to the use of maghemite nanoparticles at pH < 5 to remove sulphate, manganese, copper, nickel, cobalt and zinc metal ions from acid mine drainage (AMD). In conventional AMD treatment, these pollutants are only removed at higher pH, and that requires costly alkaline chemicals. The only metals known to precipitate at low pH are iron (III) and aluminium (III). The pH of AMD is extremely low and, to effectively achieve the almost complete removal of the pollutants, method optimisation is required. Relative to the conventional way of treatment, adsorption is highly convenient, cost effective and considered to be a noble process. For this invention, a combination of adsorption and precipitation processes has been employed to achieve high metal and sulphate removal. The corresponding removal percentages of pollutants achieved in this study were sulphate (89%), manganese (79%), cobalt and zinc (98%), nickel (96%) and copper (100%). Overall, the employed method makes use of less chemicals to remediate AMD pollution under cost-effective scenarios, while the possibility exists to recover valuable resources from AMD.

Market need

There are several treatment options for AMD. Neutralisation, using alkaline industrial chemicals such as calcium hydroxide and limestone, is more popular for the removal of metals through metal hydroxide precipitation and sulphate as gypsum, which is a skeleton of sludge builder in AMD. Notably, since both metals and sulphate are simultaneously precipitated together, it is not cost effective to recover either the metal hydroxides or sulphate from the sludge. The produced sludge is commonly disposed of in landfill sites and forms enormous tailing, which is also a cause of concern for environmental pollution due to the leaching of metals from the tailings. Cost-effective AMD treatment technology is needed, where the recovery and reuse of valuable resources are possible.



Features

- High removal of sulphate and metals at low pH
- No additional alkaline chemical required to increase the pH



Benefits

- Efficient and cost-effective AMD treatment
- Water recovery for agricultural use



Industry

Water

Creators

Kebede Kefeni and Bhekie Mamba

Stage of development

Laboratory prototype

Intellectual property

Provisional Patent Application (SA)

Desired relationship

Co-development partner, investor

Method and Apparatus for the Treatment of Wastewater

Technology

The technology involves a method and an apparatus for treating a fluid, using nanoscience. Impurities in the fluid are trapped by charged nanoparticles. The fluid is contained in a reactor that includes a moving magnetic system. When the reactor is in use, the moving magnetic system excites the charged nanoparticles carrying the impurities, thus mobilising both the particles and the impurities. This reduces the energy requirement, as only the particles of interest are mobilised in the system. Since the system contains no moving parts, maintenance costs are greatly reduced. The system can be tailored for specific applications.

Market need

The problem of removing particles after purification led to the idea of a nanoparticle that has a magnetic core. These magnetic nanoparticles have been around for a while and many "removal techniques" have been developed and researched to increase the efficiency of removal. These systems continue to utilise mechanical excitation methods involving the nanoparticles, thus the moving parts are subject to wear and tear. The purpose of this project is to build a next-generation prototype that utilises a moving electromagnet to move charged nanoparticles in a fluid. As demonstrated in laboratory systems, the system works well to remove specific impurities in water, and there is a need to scale this up.



Features

- ⚙️ Magnetic reactor system that utilises an electromagnetic field mobilised nanoparticle
- ⚙️ Achieves a purification with zero moving parts



Benefits

- ⚙️ Produces relatively high levels of efficiency Water recovery for agricultural use
- ⚙️ Efficiently removes impurities from water or any liquid medium



Industry

Water

Creators

V Vallabhapurapu, IW Hofsajer & HO Wei Hua

Stage of development

Lab-scale prototype

Intellectual property

Pending Patent Applications (USA, Brazil, Europe, Japan, ARIPO & SA)

Desired relationship

Co-development partner, investor

Sprinkler Guard

Technology

Conventional irrigation sprinklers which are fitted with riser pipes above ground are prone to mechanical damage and disorientation. As a result, the lifespan of the irrigation system is shortened, or the potential of irrigation systems to optimally irrigate the required surface areas are compromised. The vertical pipes of the irrigation sprinkler that are exposed above-ground are often not fitted in a uniform or an aesthetically pleasing fashion, which affects landscape design. This technology offers an alternative solution aimed at managing the destruction and damage associated with rigid irrigation riser sprinkler pipes, while improving the aesthetics of irrigation landscape systems. The Sprinkler Guard is a protective fixture that is positioned around the riser pipe above the ground, to protect both the sprinkler and the riser against damage. Designed with aesthetically pleasing features and custom fitted, the Sprinkler Guard complements any landscape design.

Market need

Due to their extensive use in the residential and commercial sectors, sprinklers dominate the landscape irrigation market. Manufacturers of sprinklers invest vast resources to produce devices that will efficiently distribute water with a high degree of uniformity. However, despite advances in irrigation systems, their usable lifespan is often short lived due to mechanical damage which demands replacement, thereby increasing costs. Furthermore, water conservation is an ongoing concern for the landscape irrigation sector, which requires efficient solutions. The Sprinkler Guard technology introduces a solution that protects sprinklers against avoidable damage, thereby improving the efficiency and usable lifespan of irrigation systems, while creating aesthetically pleasing landscapes.



Features

- Rigid body with a base that sits on the surface, to maintain correct positioning of the sprinkler and prevent its disorientation
- The height of the Sprinkler Guard matches that of any conventional sprinkler
- Customisable for conventional sprinklers



Benefits

- Guards against mechanical damage, increases lifespan and ensures water conservation
- Suitable for protecting various types of conventional sprinkler risers
- Reduced maintenance and replacement costs for irrigation risers
- Improves the efficiency of the irrigation system
- Improves the aesthetics of landscape design



Industry

Water

Creator

Hennie Stoffberg

Stage of development

Prototype

Intellectual property

Pending Patent Application (SA)

Desired relationship

Co-development partner, investor

Flexible Sprinkler Riser

Technology

An irrigation sprinkler riser technology which comprises a flexible, tubular body which is installed to join from the lateral water supply pipe to the sprinkler head, allowing adjustable positioning of the sprinkler at various angles or directions by means of an adjustable knob. The body of the flexible sprinkler riser is developed using tubular material, where an adjustable knob allows for the rise or collapse of the riser, depending on the presence or cut-off of water supply. The ability of the riser to collapse when not in use protects the sprinkler from mechanical damages that may occur if rigid sprinklers constantly remain in an upright position. The irrigation sprinkler riser technology therefore offers a simple and adjustable pipe for efficient and cost-effective irrigation.

Market need

Irrigation failures and damage are a result of many factors, including inefficient irrigation systems, the age of the landscape, proximity to trees, rodent activity and vandalism. Although other sprinkler systems have been introduced to support durability, many systems still suffer from wear and tear, and require constant replacements, making them expensive to maintain. The Flexible Sprinkler Riser technology aims to improve the lifespan of irrigation sprinklers by providing a cost-effective, flexible body riser that protects risers from mechanical damage by means of a collapsible tubular body, and is easily adjustable at various angles, to allow optimum irrigation even with changes in water pressure.



Features

- ⚙️ Flexible tubular body with an adjustable knob
- ⚙️ Adjustable knob allows for changing angles of irrigation
- ⚙️ Body is collapsible body when not in use



Benefits

- ⚙️ Irrigates desired locations Improves optimum irrigation
- ⚙️ Protects sprinklers against mechanical damage
- ⚙️ Lower maintenance costs Adjustable knob enables optimum irrigation even with variations in water pressure



Industry

Water

Creator

Hennie Stoffberg

Stage of development

Prototype

Intellectual property

Pending Patent Application (SA)

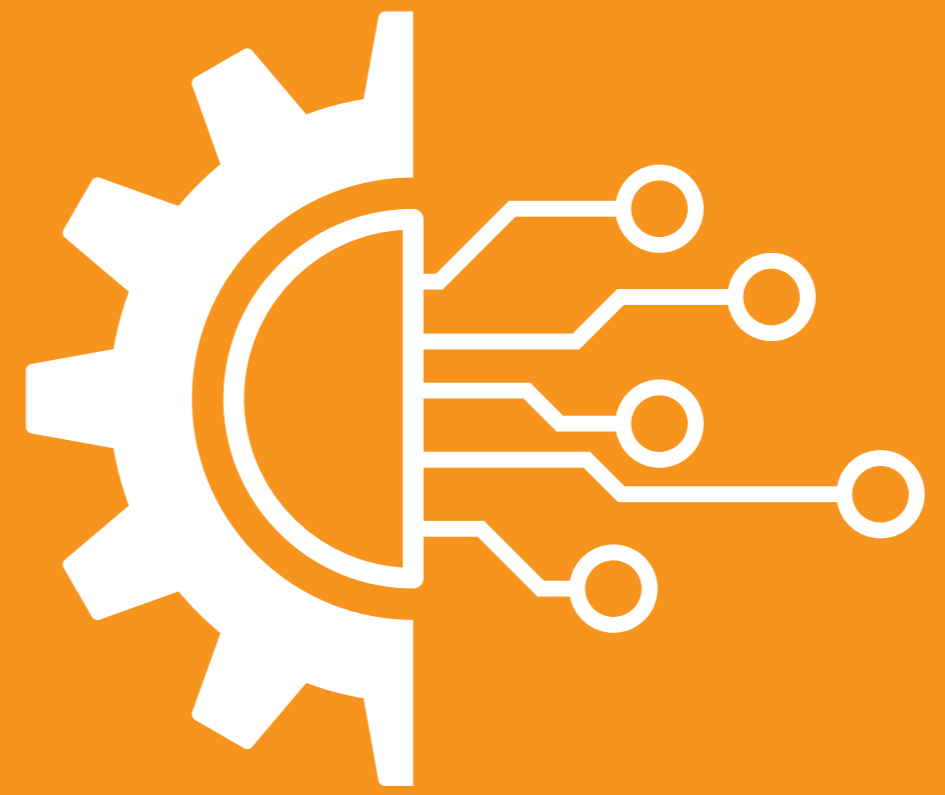
Desired relationship

Co-development partner, investor



LEARNING AND INNOVATION GO HAND IN HAND. THE ARROGANCE OF SUCCESS IS TO THINK THAT WHAT YOU DID YESTERDAY WILL BE SUFFICIENT FOR TOMORROW.

- WILLIAM POLLARD



ICT

Academic Staff Rating Index

Technology

The Academic staff Rating (AR) Index is an interactive platform designed for supervision management. It aims to enhance the student-supervisor relationship, while also providing a rating index for supervisors. The index aims to improve transparency and the quality of academic student supervision, by providing information on the quality of supervision at higher education institutions. For prospective students, this platform will provide a point of reference when seeking a supervisor. University management and Human Resources (HR) can use the rating system to screen candidates for recruitment and identify the training gaps required for supervisors. Academics (lecturers, teachers and key personnel) can use the system as a reflective or training diagnosis tool to help identify weaknesses and improve the quality of supervision. It can also serve as a measurement tool for incentives and for evaluating supervisors' performance.

Market need

The relationship between research students and their supervisors is crucial, both as a channel of intellectual knowledge and for the success of students. The process of supervision can, however, be complicated by multiple factors, resulting in students not completing their qualifications. While universities face the challenge of empowering supervisors and students alike, the traditional model of supervision is known to disempower the student, as it focuses on technical aspects of the supervisory relationship, without factoring in the processes employed to shape the student. The AR Index aims to empower students by providing a platform where they can gain insight into the type of supervision they are likely to receive, prior to selecting a supervisor. The platform also allows university management to evaluate the nature of supervision which students require, with a view to improving services.



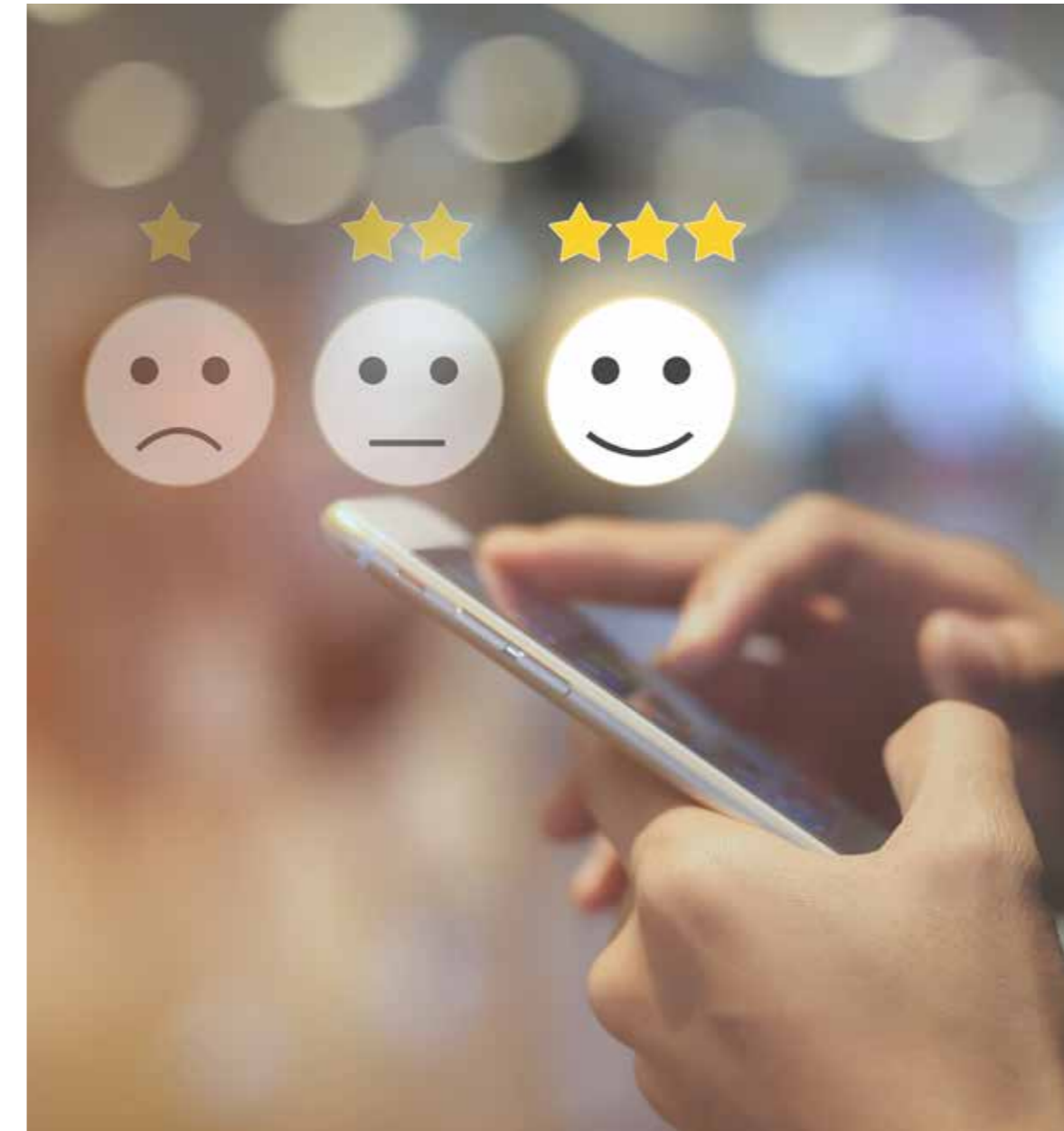
Features

- Online interactive platform for students and supervisors
- Graduate supervision management system
- Academic supervisor rating system
- Ratings feature



Benefits

- Improves transparency and the quality of academic students
- Facilitates communication Measures performance
- Measures supervision service quality
- Provides HR and management intelligence



Industry
ICT

Creator
Marcia Mkansi

Stage of development
Prototype

Intellectual property
Copyright

Desired relationship
Co-development partner, investor

Predictive Index Software

Technology

Predictive Index Software offers a match-making assessment tool for the academic research sector. It is designed to predict an individual's paradigms and philosophical stance, which have implications for research. The software is useful in assisting researchers to determine which paradigm and philosophical stance most closely align with their beliefs, which is ultimately useful in designing a robust research methodology. Novice researchers can use the tool to understand different philosophical perspectives and their major implications much earlier in their research careers. Using the Predictive Index Software, universities can align research students with supervisors who share common paradigms and philosophical stances. Ultimately, the tool will improve the quality and credibility of the research produced at universities.

Market need

New researchers are often not equipped with the skill of determining an appropriate research methodology or the rationale required to undertake a rigorous research project. This is due to a lack of the basic tools necessary for aligning the conceptual framework, and the ontological and epistemological perspectives which are crucial for designing a research methodology. Advocates of acknowledged research methods warn that if these underlying paradigms and philosophies are taken for granted, not identified or discussed, issues of bias and implicit assumptions regarding certain aspects of the inquiry or phenomena will be prevalent, making it difficult to question, consider and discuss the findings and views of such research.



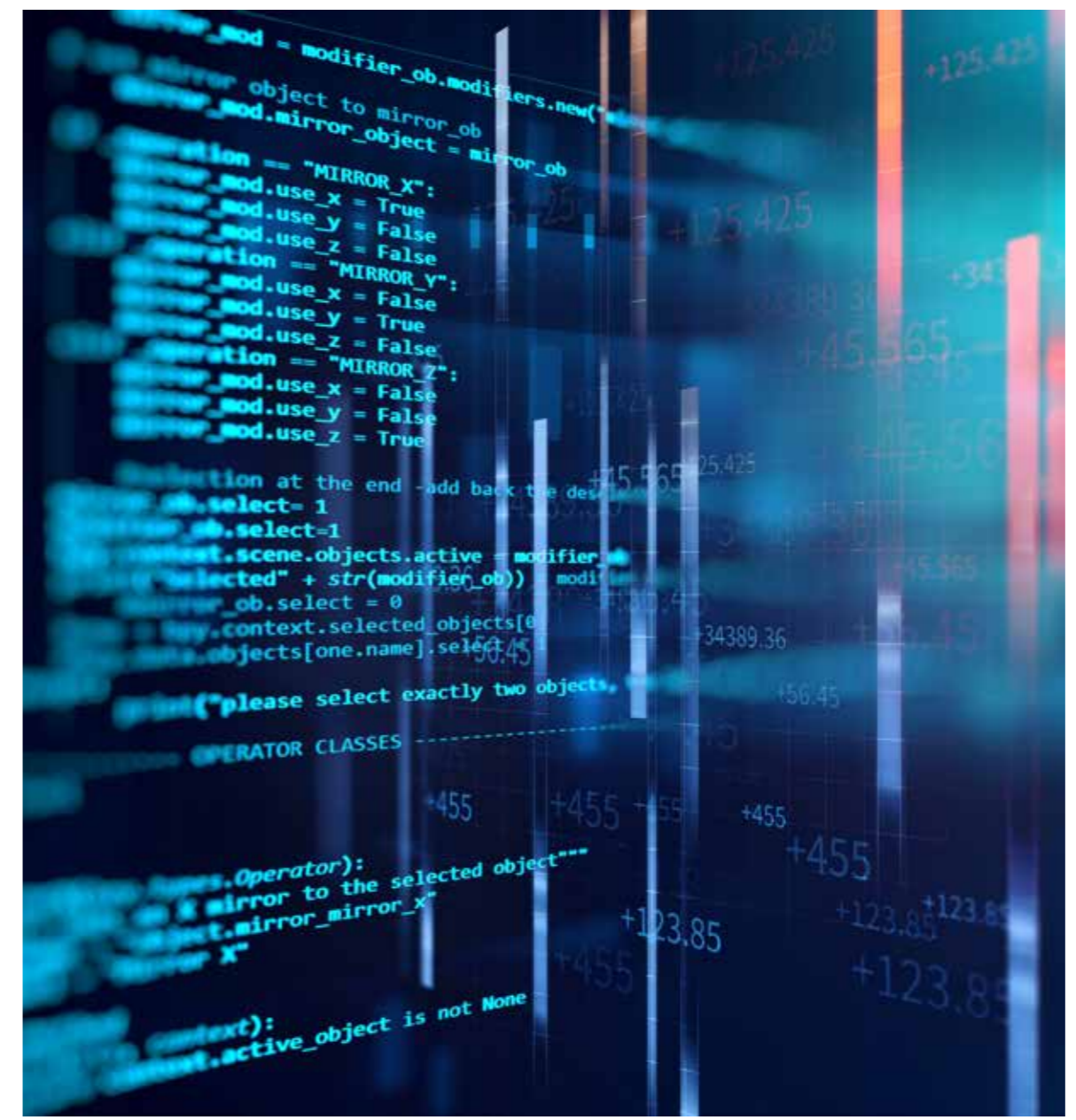
Features

- ⚙ Predicting the philosophical stance of research provides a platform for decision making
- ⚙ Matching philosophical stance with appropriate research questions Automated prediction
- ⚙ Simple to use and easily accessible Customisable for all areas of research



Benefits

- ⚙ Improves the quality of research and strengthens research credibility
- ⚙ Enhances teaching and learning
- ⚙ Increases awareness of philosophical underpinnings and scholarly debate
- ⚙ A platform for knowledge development and future research



Industry

ICT

Creator

Marcia Mkansi

Stage of development

Prototype

Intellectual property

Copyright and Pending Trademark Application

Desired relationship

Co-development partner, investor

Photonic Data Processing and Sensors on Chip

Technology

The technology relates to a new generation of telecommunications and data-processing technology, with improved wavelength sensitivity in the visible and near-infrared wavelengths range, rather than microwave communication in 2–4 GHz. The technology provides the realisation of optical sources (LEDs), that can be fabricated directly on silicon chips, thereby overcoming functionality losses, and eliminating cross-talk and interference, as encountered in current processing technology on chip. It utilises low silicon processing and manufacturing technology, and standard silicon manufacturing procedures such as CMOS, TTL and RF bipolar processing technology. It can produce complete photonic systems on chip at lower cost than current technologies. The technology also allows for the development of new from-chip-to-environment communications systems (LiFi). Furthermore, its broadband emission characteristics (0.5–1.2 microns) makes it particularly suitable for the generation of low-cost, on-chip micron-dimensioned gas, analyte and bio-sensor systems that can be realised at low cost, and a multitude of contexts on chip, used in conjunction with data-processing technology. This can align with futuristic Internet of Things (IoT) technology.

Market need

Over the past decade, a tremendous growth in communication technology has been observed. There are, however, concerns about functionality losses and high energy consumption at high bit rates in new, emerging technologies. Silicon photonic integrated circuits (SPICs) have attracted significant interest due to their ability to carry data at more affordable cost structures. The realisation of a multitude of sensors on silicon chips will also be in high demand in future, given the rapidly growing IoT market.



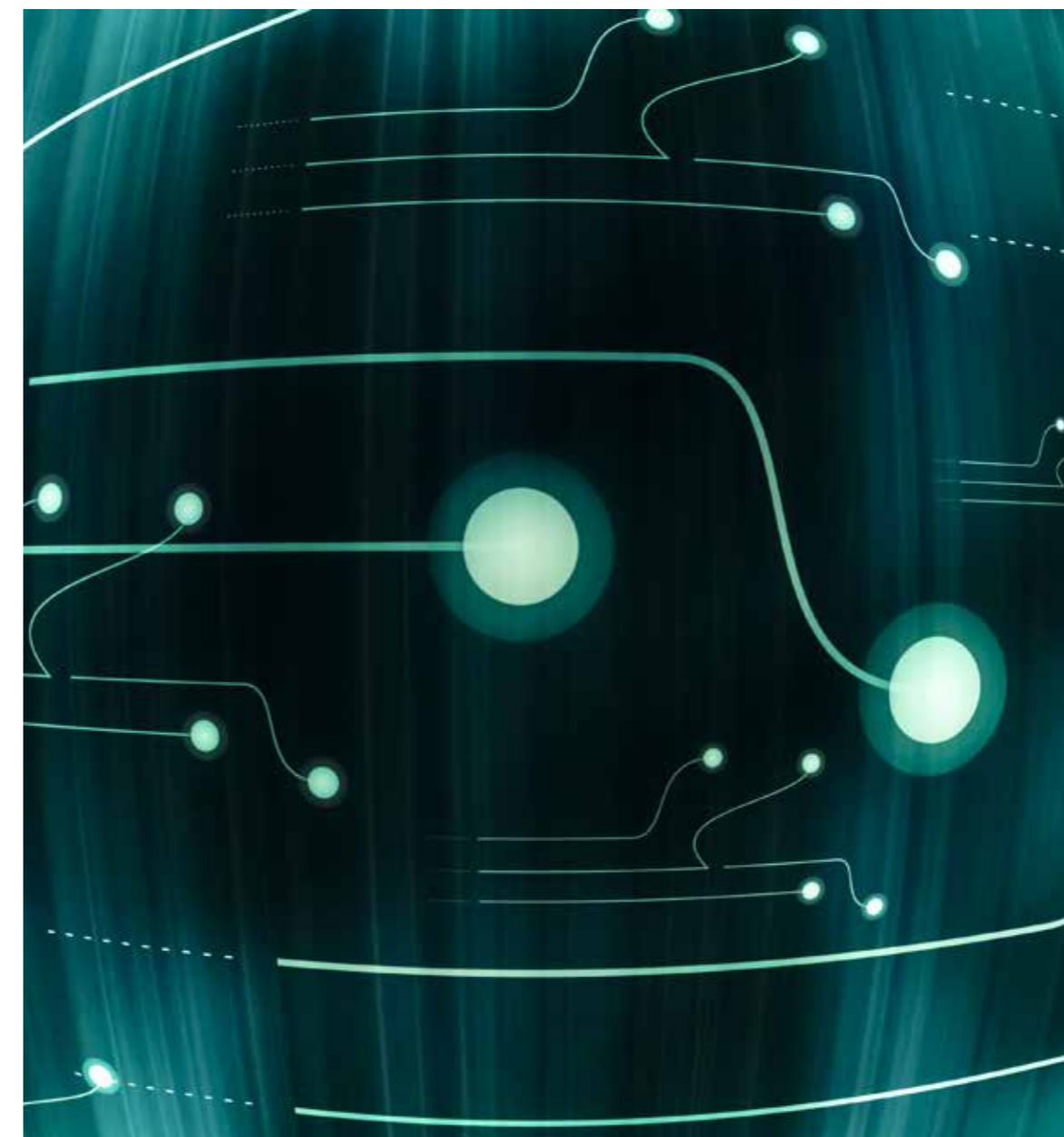
Features

- High data bandwidth into the GHz range
- Broadband wavelength optical sources
- Sensor on-chip capability



Benefits

- Reduced cost of data transmission in visible and infrared wavelength region.
- Eliminates cross-talk and interference on-chip
- On-chip multitude gas, analyte and bio-sensor realisations



Industry

ICT

Creator

Lukas Snyman

Stage of development

Prototype

Intellectual property

Pending patent Applications (Europe, SA, USA & China)

Desired relationship

Co-development partner, investor

Chitosan-Based Resistive Switching Memory Device

Technology

The invention relates to a method of fabricating a commercially viable, biodegradable and transparent ReRAM chip with substantially high (>7 orders of magnitude) resistive switching behaviour using low operating power. The method makes use of a simple and affordable scalable fabrication process of an active biodegradable polymer, to produce a transparent ReRAM chip. The device, which is made up of biodegradable material (polymer-chitosan), is reliable for use in next-generation electronic devices, as it responds to environmental sustainability regulation through the reduction of electronic waste.

Market need

ReRAM has overcome the challenges faced by DRAM and SRAM, of content loss by using materials that change resistance in response to voltage. This means that the memory device has good scaling behaviour which will not result in memory loss in the event of power cuts. However, despite their unique features, the use of these non-biodegradable (inorganic) materials leads to an increase in electronic waste, which is an environmental hazard. Therefore, there is a need to develop an environmentally friendly product with a comparative efficiency, to reduce electronic waste.



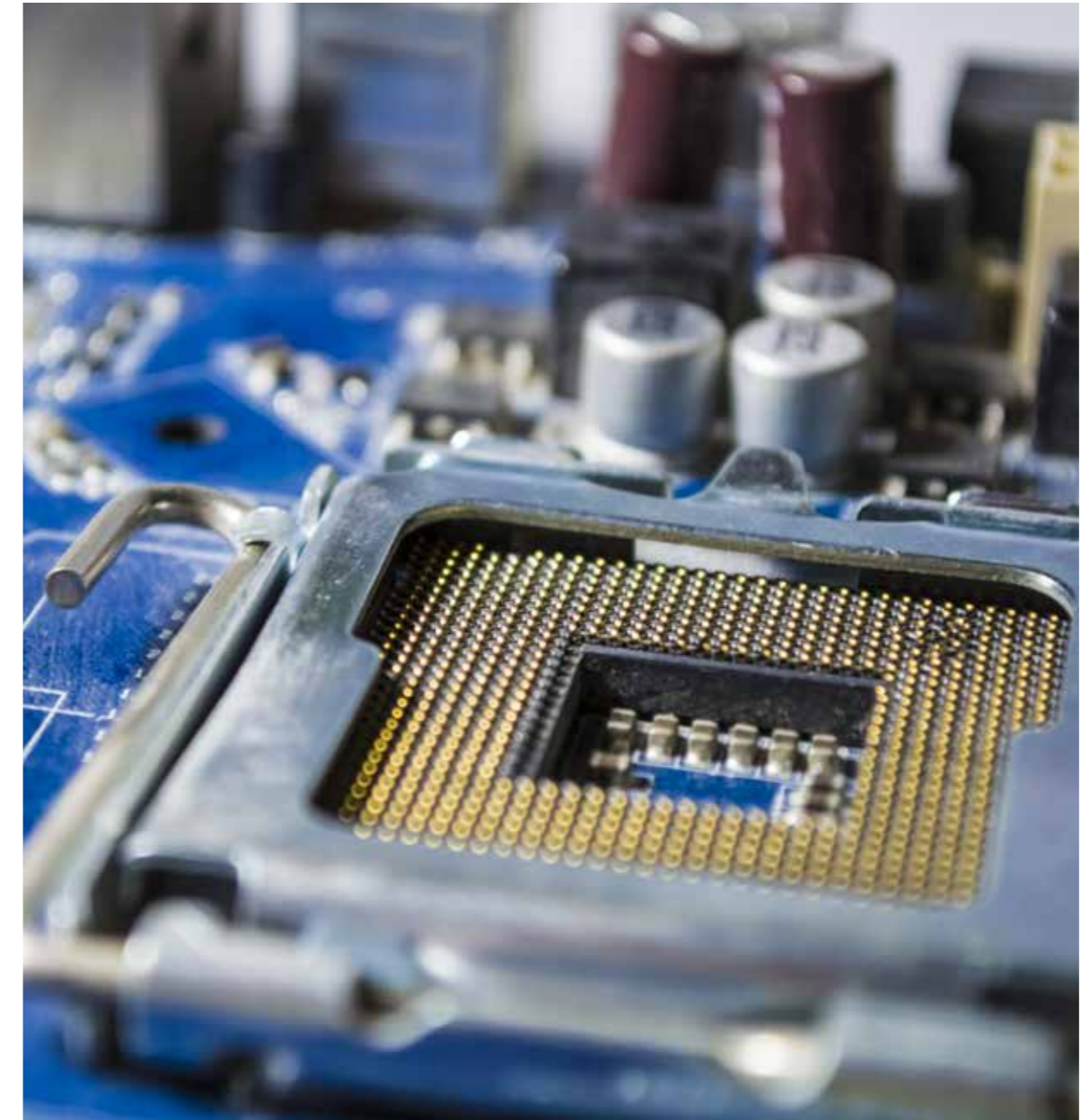
Features

- ⚙ Chitosan aluminum zinc oxide single layer biopolymer material
- ⚙ High performance parameter
- ⚙ Two terminal structure (reduces the amount of hardware required)



Benefits

- ⚙ Simpler to manufacture (cheaper and readily available material)
- ⚙ Biodegradable (environmentally friendly)



Industry
ICT

Creators
Ms Sreedevi Vallabhapurapu, Prof Ananthakrishnan Srinivasan & Prof Vijaya Srinivasu Vallabhapurapu

Stage of development
Prototype

Intellectual property
Provisional Patent Application (SA)

Desired relationship
Co-development partner, investor

Coordinating the Efficient Distribution of ACTs Drugs

Technology

A mobile application to facilitate the efficient delivery of artemisinin-based combination therapies (ACTs) which are dependent on a multi-embedded supply chain coordination for the distribution of malaria drugs. The distribution of these drugs is hampered by a lack of coordination among stakeholders responsible for the delivery, due to multi-dimensional nature of the logistics. The application aims to improve access to ACTs by offering a mobile-based coordination of their delivery. The application is operated using both internet and USSD functionality, thereby coordinating the delivery of ACTs in both urban and remote locations. By increasing access to ACTs, the maximum efficacy of the drug will be achieved, and patients will receive adequate treatment outcomes.

Market need

Access to ACTs for patients in remote or rural areas remains a challenge, due to limited healthcare facilities in those areas. It is costly for patients who must travel long distances to access the drugs. As a result, treatment is often compromised due to a lack of finances, causing patients to miss their prescription and thereby increasing opportunities for the emergence of drug resistance.



Features

- ⚙️ Cross-systems application (mobile, desktop) to ensure access across various platforms (USSD and online)
- ⚙️ Live tracker to record, monitor and update stock levels and the distribution of stock
- ⚙️ Multi-stakeholder interface to allow users with various roles and security levels
- ⚙️ Economic order queue alert feature, to manage stock for warehouse supply
- ⚙️ Overstock alert feature, to support forecasting and budgeting
- ⚙️ Network transparency tool



Benefits

- ⚙️ Coordinated and transparent distribution
- ⚙️ Improved access to ACT drugs
- ⚙️ Stakeholder management



Industry

ICT

Creators

Marcia Mkansi & Oluka Nigitta

Stage of development

Prototype under development

Intellectual property

Copyright

Desired relationship

Co-development partner, investor

Grocery Delivery App

Technology

The technology relates to an application that allows the efficient delivery of groceries ordered online, using a car lift service operated by general road drivers. Unlike existing delivery applications, this platform increases the reliance on dedicated delivery vehicles, but makes use of a network of general road users to participate in the collection and delivery of groceries purchased online by other users. By using the shared value model, the application offers the cost-effective delivery of groceries, ensuring transparent and effective delivery by linking customers and grocery e-retailers within a defined radius, to enable participation in customer–retailer supply and distribution. As a result, the costs associated with supply and distribution are lowered.

Market need

While e-commerce has significantly improved the supply chain by speeding up the delivery of goods and improving the customer experience, the last-mile delivery is faced with numerous challenges, including cost, transparency, efficiency and friction. Although the delivery costs of the last mile are often passed on to the customer, transparency, efficiency and frictionless delivery are crucial features for customers who make online purchases.



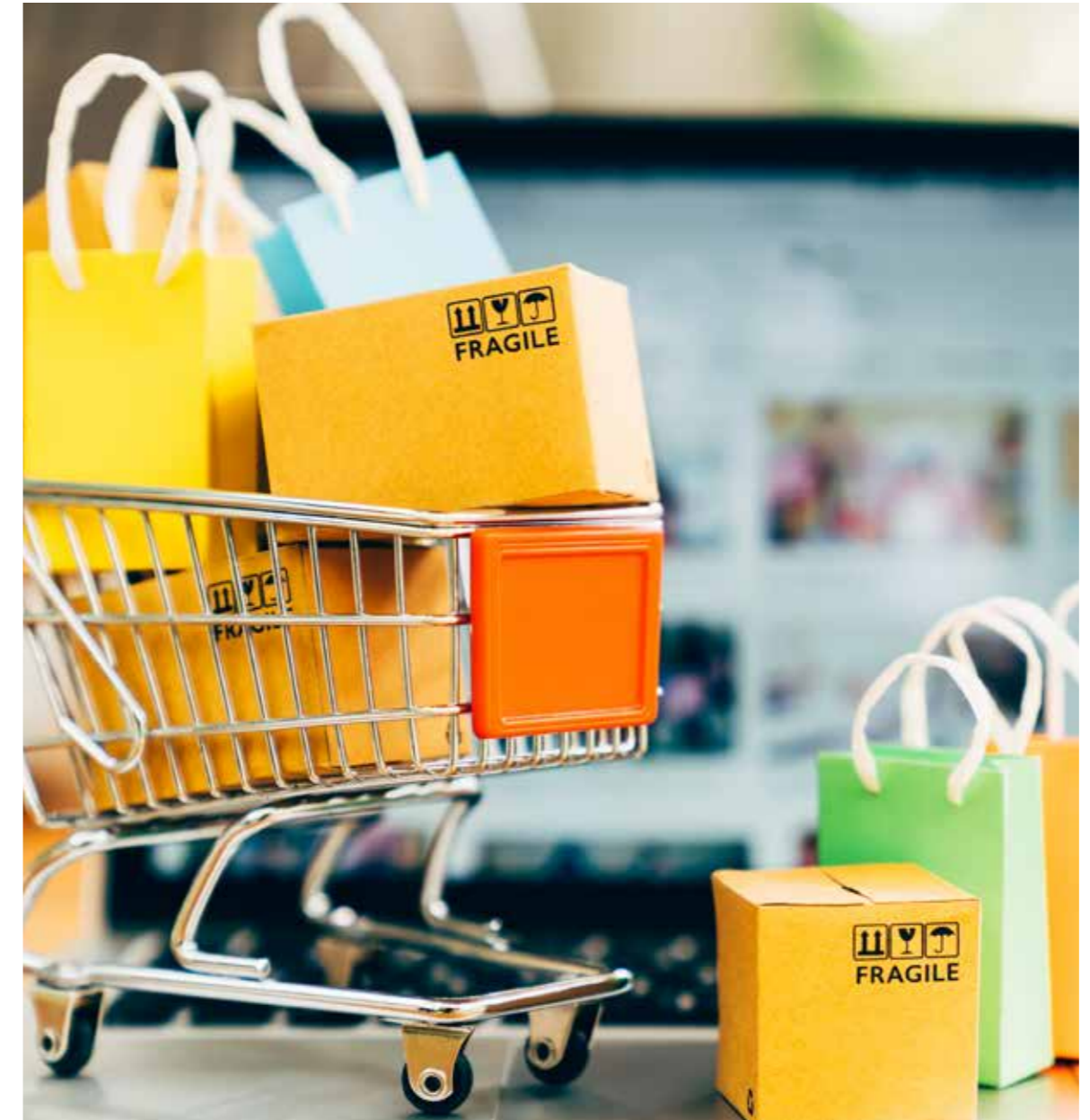
Features

- ⚙ On-demand grocery delivery by general vehicle users
- ⚙ Real-time tracking
- ⚙ User rating platform
- ⚙ Safe payment platform



Benefits

- ⚙ Simple, efficient and transparent delivery of groceries
- ⚙ Cost effective
- ⚙ Ease of management
- ⚙ Users can make informed decisions



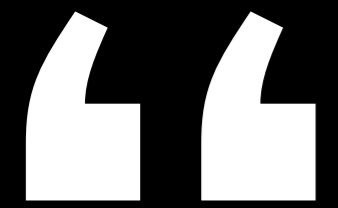
Industry
ICT

Creator
Marcia Mkansi

Stage of development
Prototype

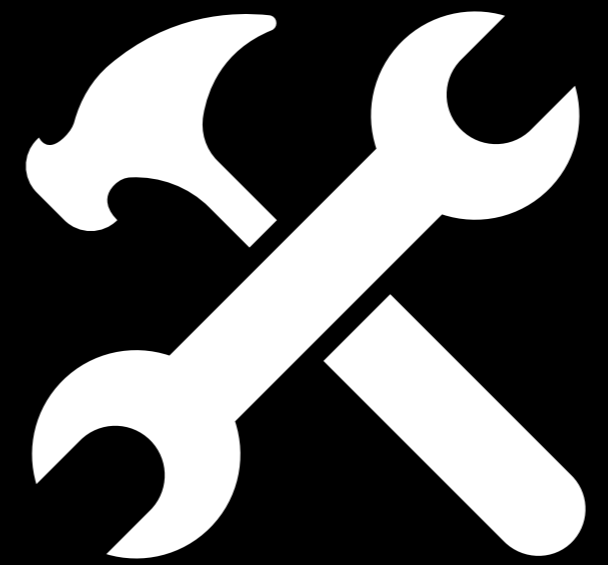
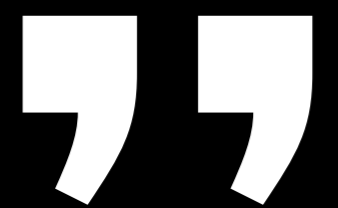
Intellectual property
Copyright

Desired relationship
Co-development partner, investor



AFRICA'S FUTURE IS INNOVATION RATHER THAN INDUSTRIALISATION.

- WORLD ECONOMIC FORUM



MANUFACTURING

Automatic Healthcare Assistance Device

Technology

The Automatic Healthcare Assistance Device (AHAD) is a multifunctional healthcare assistance device that supports people with visual, mobility and speech impairments. The device makes use of robotics, telemetry, sensors and voice control features, to provide a range of functional support to patients and the aging population, people with physical and mental disabilities, and those with walking impairments.

Market need

The World Health Organisation estimates that over 15% of the world's population has some form of disability, and up to 3.5% of adults have significant difficulties functioning.¹ Furthermore, there is an increase in the rate of disability due to population ageing. Much of the healthcare needs related to disabilities remain unmet due to a lack of adequate healthcare systems. Disability limits a person's ability to perform certain activities, as a result of impairment. There is a significant need to improve the healthcare outcomes of people with disabilities. Many types of diseases can impact speech, mobility and visualisation. Conditions such as paralysis, cerebral palsy, stroke, multiple sclerosis, muscular dystrophy, arthritis and spinal cord injury can result in mobility, visual and speech impairments that require supportive devices for the individual to regain functionality. Canes, walkers and wheelchairs are the gold standard instruments for supporting these impairments, but a patient may still require multiple devices to regain full functionality.

¹ <http://www.who.int/mediacentre/factsheets/fs352/en/>



Features

- ⚙️ Single device that provides multifunctional healthcare assistance
- ⚙️ Fully automated healthcare device
- ⚙️ Increased efficiency



Benefit

- ⚙️ Improved patient support



Industry
Manufacturing

Creator
Maria M Jakovljevic

Stage of development
Prototype

Intellectual property
Granted Patent (SA)

Desired relationship
Co-development partner, investor

Floatation Device

Technology

The Floatation Device is a system that acts as an anchor and elevator for equipment, shacks and mobile houses that would otherwise be affected by flooding. During the rainy season, the Floatation Device elevates items far above the storm water and provides stability to protect items from being damaged and prevent them from being swept away by the water.

Market need

Flooding in South Africa is estimated to have a frequency of 37.9% annually and informal settlements are worst affected. The devastating effects of flooding of shacks in informal settlements present an increasing challenge. Disaster management centres in various cities continue to provide interventions for affected communities in different provinces during the rainy season. Although municipalities work hard to provide solutions through regular flood awareness campaigns, as well as passive and active flood warning signs, there is a need to develop technology which will reduce the effects of flooding. The Floatation Device offers a solution for preventing flooding in informal settlements and reducing the number of communities being displaced due to flooding.



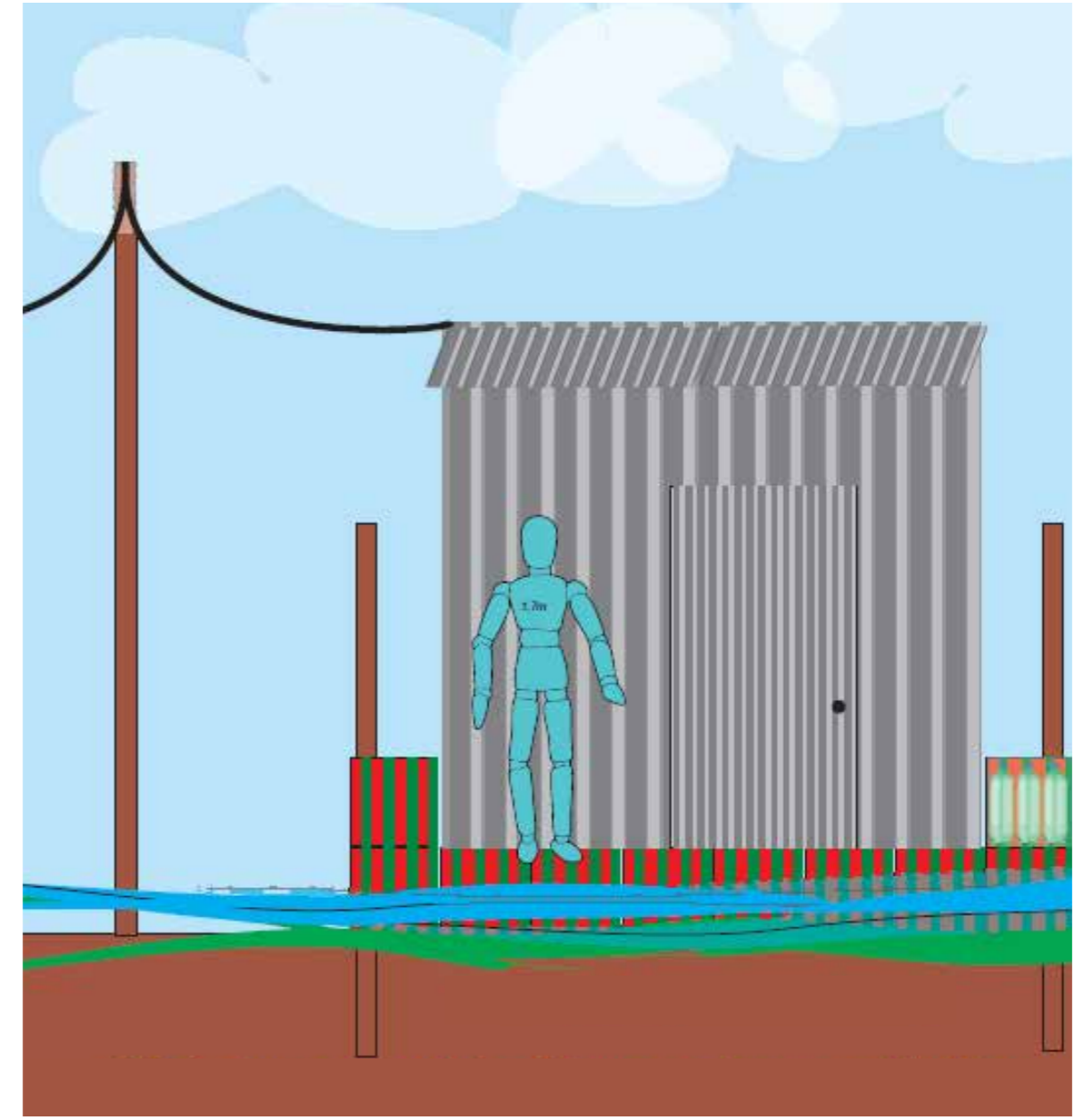
Features

- ⚙ Elevates a shack base (foundation), so that floodwater runs underneath the structure
- ⚙ Special interlocking system
- ⚙ Crates are specially built so that the base can be extended



Benefits

- ⚙ Valuables inside the shack are better protected from water
- ⚙ Reduce the number of flood victims in and around susceptible areas



Industry
Manufacturing

Creator
Patricia PM Gouws

Stage of development
Lab-scale prototype developed

Intellectual Property
Granted Patent (SA)

Desired relationship
Co-development partner, investor

Waste Beer Recovery

Technology

The technology relates to an improved method for reclaiming waste beer from the brewing process. The process ensures the sterilisation and re-use of beer that would otherwise be lost in the brewing process due to contamination. The method focuses on recovering beer lost in the fermentation stage, treating it with ultraviolet (UV) light and recycling it back to the fermentation process. When a large amount of beer is lost during excess yeast removal, the UV sterilisation step will ensure that the beer is sterilised to acceptable standards, then introduced back into the process. While many different techniques have been introduced to recover the valuable amount of beer that is lost during yeast removal, each technique delivers different results in terms of the beer taste (quality), implementation, ease of use, as well as financial returns. The significant role of these techniques is to reduce the quantity of beer and water that is lost. However, the concentration and taste (quality) of the beer remain of greater concern.

Market need

A significant amount of beer is lost when removing unwanted yeast during the brewing process. For example, for each 1 000 ml of yeast removed, up to 400 ml of this volume consists of beer which is wasted. Beer production requires significant quantities of water – up to 3.5 L to produce 1 L of beer. This means that the beer that is lost during the removal process equates to the loss of water used during the process (3.5 L times the volume of beer lost), as well as the water required for growing and processing raw materials used in the brewing process. This signals that the quantity of water wasted during the brewing process, is significant.



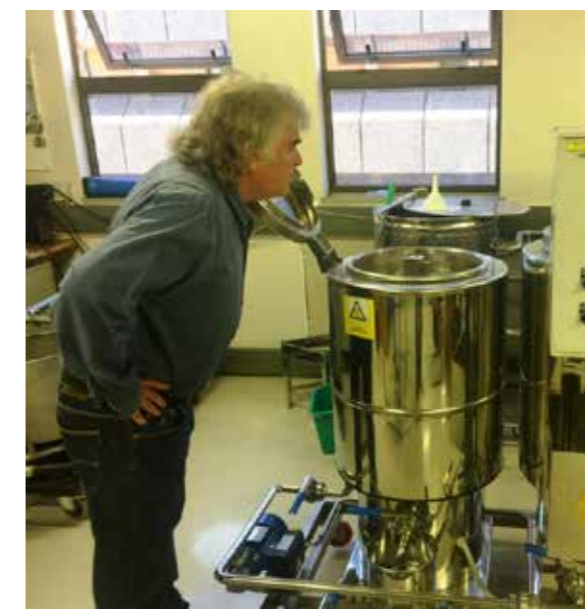
Features

- ⚙️ UV light beer sterilisation
- ⚙️ Recycling of sterilised beer back into the brewing process



Benefits

- ⚙️ Treatment of wasted beer
- ⚙️ Increased brewing efficiency
- ⚙️ Water conservation



Industry
Manufacturing

Creators
John Dewar and Craig Groeneveld

Stage of development
Prototype

Intellectual property
Patent applications pending (USA, SA, Brazil, Europe, China, Russia & Europe)

Desired relationship
Co-development partner, investor

Cost-effective Mass Production of SQUIDs MRI Technology

Technology

The invention relates to an automated process for fabricating nano and micro structures using high-temperature superconducting quantum interference devices (SQUIDs). This method overcomes the high cost and complexity of the process of manufacturing superconductors on a commercial scale or through mass production. The method applies the well-known Femtosecond Laser-based method to fabricate micro and nano-constriction-type structures using an automated programme, providing better control and the pre-programmed manufacturing of an array of superconductors.

Market need

Today, reliable and stable thin-film Josephson circuits can be manufactured in large quantities. However, the production process of good-quality SQUIDs is not that simple. The main challenge lies in the technically demanding fabrication process of reliable high-temperature superconductors. Most well-established fabrication technologies fail, particularly at nano scale. Even extremely sensitive SQUIDs present challenges when it comes to manufacturing.



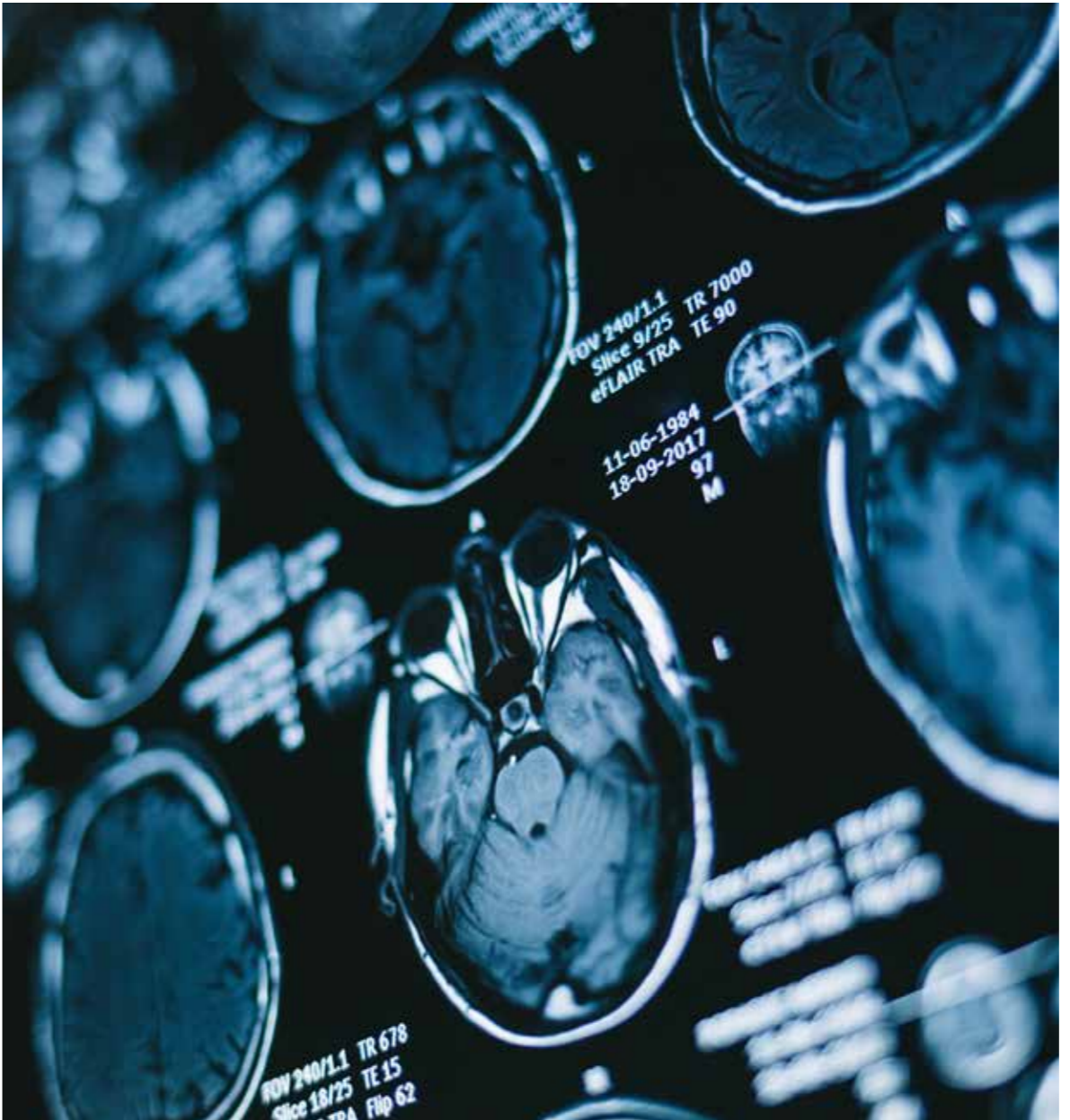
Features

- Automated manufacturing process of high temperature superconductors
- Produces perfect interfaces and uniform barriers which ensures good reproducibility
- Improved signal-to-noise ratio and increased strength and performance of the SQUID



Benefits

- Computer aided manufacturing language ensures faster manufacturing of SQUID Reduce costs for mass production
- Production of viable SQUIDs technology



Industry
Manufacturing

Creators
Patrice Umenne & Vijaya Srinivasu
Vallabhapurapu

Stage of development
Prototype

Intellectual property
Pending Patent Applications (China, SA, Australia, India & Europe)

Desired relationship
Co-development partner, investor

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