

COVER STORY

From research labs to the market

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EVERY year universities invest in research and development (R&D) to come up with technologies that can be applied in so many ways. The idea behind the innovations is that the newfound knowledge or discoveries will stand to benefit businesses and communities through workable solutions.

Translating lab-scale innovative technologies into shelf-ready products, however, is not as straightforward as many people think.

Professor Dr Samsilah Roslan, who is director of Putra Science Park (PSP) — the centre of innovation management and technology transfer office at Universiti Putra Malaysia (UPM) — said tertiary institutions have to partner with business entities to commercialise innovations.

But business entities are reluctant to invest in disruptive technologies and those uncertain in terms of generation of reasonable profit.

"That is why we have set up InnoHub, an innovative commercialisation approach pioneered by PSP in 2013. It provides a supportive and fertile ecosystem for innovation to translate into commercial products, especially within the university environment," she said.

"At InnoHub, we validate the market for our innovations and develop a pool of technopreneurs who understand both the technology and how to make a business out of it.



By transforming mindset, people can move the world.

RAHINAH IBRAHIM
UPM senior professor of architecture

"This programme is unique because our graduate students are paired up with our researchers in start-up companies to work on testing and validating a business model that will work for the technology that they are developing."

Some 52 start-ups are being groomed at Innohub. They undergo a comprehensive training module to further research into market validation of their R&D technologies. An evaluation panel consisting of internal and external experts select 10 start-ups each year.

InnoHub nurtures technopreneurs who translate technologies and innovations into market viable products by developing the best go-to-market plan from the market validation exercise. The feedback loop, which the start-up must engage, does not only occur within InnoHub but also with the outside world, customers, vendors, suppliers, the value chain and start-up ecosystem."

To date, UPM has generated more than RM400,000 intellectual property licensing revenue from InnoHub start-ups which have raised over RM7.8 million from grants and investors, validating that the start-ups are moving in the right direction.

Innohub recently graduated 10 of such start-ups from the 52 in its pool.

"Our criteria for graduation include completing the market validation activities — which will result in a validated business model — and sustainably running the business based on the said model.



Innohub programme participants at a pitching exercise.

This normally entails that the start-up has secured enough investment to start the tech-based business and has successfully delivered batches of products to end-users. Once this happens, the first and most difficult barrier is overcome and the start-up focuses on sustaining the business."

The initial plan is for the start-ups to leave the "nest" and survive on their own. They should be able to do so since the criterion of graduating is to generate enough revenue or have enough funds to sustain themselves monthly.

"They want to remain close to the university. The start-up knows that its future products will come from UPM. There's a huge amount of untapped wealth that is being studied and discovered by researchers at UPM labs.

"UPM aspires to collaborate with fund providers and venture capitalists so that we will be able to finance our own start-ups which have technologies too disruptive to close funding gaps."

BUILDING ON WASTE

Recent Innohub graduate Pakar Go Green Sdn Bhd is helmed by inventor-cum-founder Professor Dr Azni Idris, whose area of expertise is chemical engineering with a focus on waste management, and chief executive officer Atiyah Ameenah Azni, who has a degree in science biotechnology from International Islamic University Malaysia (IIUM).

Its business is based on Azni's invention, the Biomass Microwave Carboniser (BMC), which adopts innovative green technology using microwave energy to burn biomass waste and agricultural waste, generating a high grade bio-charcoal called biochar.

The biochar produced is a charcoal-like material giving off less smoke and has a high calorific value, lower volatile content, high fixed carbon content and high surface area. It is a sustainable solid fuel with lower emission suitable for high energy demand sectors.

Pakar Go Green has a capital totalling RM1.18 million from PlatCOM Ventures Sdn Bhd, the national technology commercialisation platform of Malaysia, and UPM's Innovation Development Research Grant.

Azni said the inspiration for BMC came from his years of consultancy services and observation of waste management in the commercial sector.

There are three types of solid waste: municipal solid waste which amounts to 25,000 tonnes per day; industrial waste such as biomass from oil palm in the form of empty fruit bunches (EFB) that amounts to seven million tonnes per year; and biosolids or human waste of five million

tonnes per year.

"With my engineering background, I came up with a creative way to manage complicated waste," he said.

A palm oil processing factory generates 200 tonnes of EFB per day and there are more than 400 factories in the country.

The waste is an industrial problem, which can be solved by making biochar using a method called microwave-assisted pyrolysis where microwave energy in a chamber is used as a means of heating mechanism in the absence of oxygen.

"I started basic research in 2002. In 2010, a postgraduate student focused on in-depth research. In 2012, we built the BMC pilot plant at UPM's engineering faculty and this year, we finally produced commercial units of the biochar."

There is a trend of using biochar in powder form in agriculture in Europe where the biochar is mixed with soil and fertiliser, enabling crop yield to double. "Biochar has properties as a holder for fertiliser and moisture, and it provides the ecosystem with bacteria to help enrich it."

Biochar produced from the BMC in the form of briquettes is targeted at the energy sector as a heating source. Consumers include boiler users, the food service industry such as catering companies, restaurants and hotels as well as retail market for barbecue application.

Atiyah is involved in the business side of Pakar Go Green, listening to potential investors, customers and partners to come up with products with the right market fit.

Pakar Go Green recently signed a mutually beneficial agreement with Sime Darby Plantations for an agro-based venture. It has also entered into a collaboration with Usaha Strategik Sdn Bhd to market biochar products — powder and briquettes — to local and international markets.

"Pakar Go Green aims to be a market leader in innovative green solutions, especially for biochar products in the agriculture and energy sectors. With strategic collaborations, in three years' time, we aim to supply biochar as a soil enhancer and improve oil palm plantations here as well as supply biochar as green fuel for power generation both locally and in Asia," added Atiyah.

Currently working out of a pilot plant, Pakar Go Green is looking to build a factory within the year, with full scale output by year-end.

After her stint of dealing with many new technological findings, Atiyah, who has juggled studies and managing the company since last year, has decided to pursue a master's degree in a related field at UPM.

"The Innohub platform has guided me with a structured model. I have been mentored to pitch to funding agencies and potential investors, and have gained insight crucial to our business model."

"Through Innohub, I have been exposed to start-up/technology competitions, mentoring programmes and exhibitions. I have enhanced my knowledge as an effective leader."

ACCELERATING INTELLECTUAL EXCELLENCE

Professor Dr Rahinah Ibrahim, a senior professor of architecture and former dean of UPM's Design and Architecture Faculty, has a doctoral degree in Construction Engineering and Management from Stanford University in the United States. But she had initially failed to obtain supervisory committee approval of her main doctoral research at the end of her third year.

Desperate to complete her thesis before her scholarship ended in one year, she appealed to appear before the committee in one month with a new research question and a synthesis of 1,000 journal articles on a new topic given by the committee for her to explain why none of the existing knowledge could help her find solutions.

She had no choice but to discard her previous approach to collating information. After one month of solitude, she came up with a significant research inquiry and received the committee's approval to proceed. Most importantly, the invigorated approach helped her to complete the thesis in one year. When graduate students at UPM were in a similar dilemma, she taught them her unconventional way of developing research proposals, giving rise to the Excellence Accelerator for Grounded Learning Environment (E.A.G.L.E.) Programme which is being commercialised by Grounded Learning (G.L.) Sdn Bhd, founded by Rahinah who is also chief innovation officer.

Grounded Learning recently graduated from Innohub and is licenced to commercialise the E.A.G.L.E. Programme worldwide.

The programme is a creative and interactive visual navigator which helps doctoral students to develop impactful theses. It provides an interactive structured method and system to transform a regular professional into someone with critical postgraduate skills in a shorter period.

"The key innovation of the programme starts at the formulation of the main research question. The E.A.G.L.E. tool for this problem helps students to formulate a high impact research question and it can inform them on their rigorous literature review, whether they will eventually pursue a master's degree or doctoral research, long before they embark on it," said Rahinah, adding that while it



Pakar Go Green pilot biochar plant in UPM.



Biochar briquettes produced by the Biomass Microwave Carboniser.

took her three years to finalise her doctoral inquiry, it will only take less than one hour for a new student with the easy E.A.G.L.E. tool.

The second innovation is the development of the E.A.G.L.E. Table, a monitoring and management tool for the three-year doctoral journey.

"One can have a bird's eye view of the three-year journey in two days. Since doctoral graduation requires students to create new knowledge, the programme places emphasis on theory development by providing a fast four-level critical literature review process."

Many students were able to propose their unique theoretical framework in less time by knowing where to focus in gathering information and how to present their findings in verbatim and orally.

This critical thinking aspect, in turn, develops scholarship in students. The critical literature review process is fast yet it can uniquely reduce plagiarism among non-native English speakers who have a tendency to paraphrase sentences for authenticity.

The E.A.G.L.E. approach and tools have been used in a research methodology course at the Faculty of Design and Architecture in UPM more intensely after 2008 and the ease and simplicity of developing scholastic skills has attracted students from other faculties to join the class. The E.A.G.L.E. Programme is copyrighted in four languages: English, Malay, Arabic and Farsi at Intellectual Property Corporation of Malaysia. It is licenced to Grounded Learning for worldwide dissemination. It was selected to enter the Innohub Programme in 2015 when it received its first seed funding of RM80,000.

Rahinah's former research assistant, Rafeah Mustafa Kamal, was appointed as chief executive officer of the company. Rafeah had previously worked on commercialising Rahinah's earlier invention, SABSsystem, a modular timber framing construction system patented in eight countries.

Rafeah, a Bachelor's of Applied Arts and Design (Imaging in Industrial Design) graduate from IIUM, has the experience of translating re-

search into practical application and is a certified HRDF Trainer and a member of the Malaysian Institute of Human Resource Managers with plans to further her studies in the field of education at UPM.

"The E.A.G.L.E. Programme is available in the market through Grounded Learning. By the time the firm graduated from Innohub, it has secured RM3.64 million in sales and contracts. It has conducted workshops for more than 500 participants during its time at Innohub and had garnered traction to have signed three memoranda of understanding to disseminate the programme to Japan, Indonesia, Middle Eastern countries and India," said Rafeah.

The company has recently signed a three-year contract to train 75 certified trainers and 2,500 students at Healthcare Research Inc., based in Tokyo, Japan.

"The company is proud that Healthcare Research Inc. is keen to become its Japanese partner for training and promoting E.A.G.L.E. techniques to Japanese universities and research institutes. The Malaysian E.A.G.L.E. team will be conducting its first training in Japan after the Eidil Adha holidays."

Grounded Learning is poised to become a global player in helping people innovate their future potential in the knowledge economy.

The traditional higher education model does not support different learning cultures of individuals and organisations, specifically at doctoral level. Exposing potential doctoral students and existing ones to the simple E.A.G.L.E. tools will help build up their intellectual capability and confidence in a shorter period.

"The company believes that with such support system, it can help research and higher education institutions in Malaysia and developing countries to achieve educational excellence based on their respective local knowledge," added Rahinah.

"The company's strength is its capability to produce a number of great innovations for the global society to improve its well-being. By transforming mindset, people can move the world. Grounded Learning targets to be ready for an Initial Public Offering in several years' time."



Rafeah Mustafa Kamal



Azni Idris (left) and Atiyah Ameenah Azni at the Pakar Go Green booth during the Innohub Innovation Showcase at UPM in Serdang, Selangor.