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SYNC

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**Leading Innovation
With Industrial Collaboration**

ISSUE 3, AUGUST 2019



Letter from the Editor

Greetings fellow researchers to the third issue of SYNC, the newsletter for research happenings at the School of Engineering (SOE), Monash University Malaysia (MUM). We hope you have enjoyed our previous issue themes on “Artificial Intelligence” and a “Towards Sustainable Future”.

In this issue, we focus on “**Leading Innovation with Industrial Collaboration**”. The academic collaboration with industry can expedite the availability of innovative technologies, bringing both important public benefits and a source of resources for universities and their faculty. Our “**Feature**” section discusses the different stages of academic and industrial collaboration from collaboration, translation and commercialisation by Prof. Chan Eng Seng, A/P Narayanan Ramakrishnan and Dr. Daniel Kong respectively. We hope that the “**Career Booster**” section helps researchers in filing patents and securing grants.

Check out the motivating happenings at SOE in the “**Event Highlights**”, follow our new staff member, Dr Tan Wen Shan and fun facts in “**Break Zone**”. We always encourage feedback and therefore all are welcome to suggest or share any content, ideas, or even food for thought via email at mum.soe.aec@monash.edu. We are also open to recruit new members for the upcoming issues! Many thanks on your continuous support for the newsletter, especially to the academic staff for sharing information with us. We wish that you may find this issue a good read.

Let us **SYNC - Say Yes 'N' Collaborate**

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Insights

Industrial Collaboration



With challenging funding climate from government funding agencies, and the array of interesting problems that can be found in the industry, academics are making baby steps to build collaborations with companies. However, the beginning of the journey is always challenging and often, academics find it difficult to build rapport with industries. The solutions that has to be delivered to industrial partners have to be translational and there is more to just successfully pitching your idea to the industry. In this edition of SYNC, I am honoured to have a group of academics that are highly successful with industrial partnerships, to have them share their tips on initiating industrial collaborations and journey on working projects relevant to the industry.

And completing the package, the SYNC editorial board has reached out to Ms. Tan Siao Ping to have an overview about intellectual property protection.

I hope the readers will make good use of the information in this issue to kick-start their journey to a successful industrial collaboration!

Associate Professor Poh Phaik Eong
Associate Head of School (Graduate Research)



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How to Establish Research Collaboration with Industry?

- Arshia Fathima and Talha Shahid

Scientific research brings technological advances that impact our daily lives. Collaborations between academic and industry could accelerate technological advances and increase the likelihood of translating academic research into practical applications.

At Monash University Malaysia, Prof Chan Eng Seng from Chemical Engineering has successfully established a number of research collaborations which are funded by local and multinational companies. The companies include CCM Polymer, B. Braun Medical Industries, Novozymes, Sime Darby and Arkema Thiochemicals. Prof. Chan is also the Director of Monash-Industry Palm Oil (MIPO) Education and Research Platform. The Platform was set up to promote academia-industry linkages and to support research which can potentially impact the industry and society.

In this article, Prof. Chan shares his experience and provides a 3-step approach in establishing research collaboration with industry.

Step 1 - Establishing contact

The first step in establishing an industrial collaboration is to establish contact with industry. This may sound easy but it is actually harder than it sounds.

Industry professionals and academics are generally busy people who work in two different 'worlds'. Naturally, they do not have much opportunity to interact with each other. Academics, especially the early career researchers, normally find it difficult to meet industry professionals.

Fortunately, the Campus and the School recognize the importance of academia-industry interactions and they support many activities that involve industry participation. For example, the Campus's Industry Appreciation Dinner, the School's Flagship Leadership Programme, the Industry Advisory Panel meeting, Design Project and Final Year Project (FYP) Presentations, Invention and Research Exposition, and Industry Training visits. By participating in these activities, academics can have the opportunity to engage with industry. Alternatively, academics can choose to participate in conferences or social events that industry attends, or they can seek the assistance of the School's Industry Engagement Office to establish contact with specific companies.

The bottomline is that academics should be proactive and take the initiative to engage with industry. 'Expanding ones contacts can really open the doors to new possibilities and opportunities', Prof. Chan said.

Step 2 - 'What can you offer?'

Industry is always on the lookout for opportunities which can add value to its businesses. It is important that academics know what they can offer to industry. Academics can share their research works with industry or get industry to talk about their problems. In Prof. Chan's experience, the latter approach could be more effective because industry generally has an abundance of problems that require solutions. However, not every industrial problem is a good fit for academic research.

Therefore, academics need to be selective and preferably, choose to solve problems which are aligned to their specialization and research goal. In many cases, the solution to the problem requires the use of a combination of resources available at university: expertise, lab, facilities, manpower (FYPs or Graduate Research Students (GRS)). Academics need to be resourceful so that they can propose a collaboration deal that attracts the industry, and at the same time, benefits their own research programme.



Professor Chan Eng Seng (2nd from right) at an industrial visit to palm oil mill in Indonesia

Step 3 - Managing expectations

Since industry professionals and academics are from different worlds, naturally they have different priorities and expectations. Many academics-industry collaborations fail to take off because both parties fail to manage these differences.

For example, industry may be more interested in applied research whilst academics prefer fundamental research; industry generally prefers short term projects while academics are more comfortable with long term projects; industry wants to keep information confidential but academics want to get information disseminated.

Obviously, these differences need to be overcome. It is crucial that academics think 'outside the box' and be tactful in negotiating a collaboration deal that can balance the priorities and expectations of both parties. 'Money' (research funding) is perhaps the most 'sensitive' discussion point in any collaboration deal. Money is important, but it should not be the sole motivator when one considers to work with industry.

There are many long term and unseen benefits that academics can gain by working alongside industry. Industry can provide insightful real-life problems and practical advice. These 'free lessons' can be invaluable because they can help academics develop research programmes which can impact the real world. Besides, academics can gain exposure to the business world and hone their entrepreneurship skills. These exposures can contribute to the professional development of academics in the long run.

What's next?

Going forward, industry engagement will be an increasingly important academic activity, especially at Monash University. Prof. Chan hopes that more Monash academics can break down the 'academic silo' and start taking baby steps towards establishing meaningful collaborations with industry.

For more information about industry engagement and MIPO, please contact Prof Chan Eng Seng at chan.eng.seng@monash.edu



A student working on a pilot-scale plant co-developed with industry



Working with industry to develop a continuous molecular distillation system



“Expanding ones contacts can really open the doors to new possibilities and opportunities”

Professor Chan Eng Seng, Chemical Engineering Discipline

Exploring The Industrial Perspective

- Arshia Fathima

The need for sustainability calls for joint efforts from universities and industries to promote the translation of innovation at the labs. A recent collaboration between Arkema Thiochemicals Sdn Bhd and Monash University Malaysia is one such effort with a focus on the development of sustainable enzymes or biocatalysts for Arkema's business. Here, Dr Catherine Chang from Arkema Thiochemicals shares her insights on the characteristics of industrial research and gives her tips on how PhD students can get ready for the industry.

"Collaborations between industry and academia are symbiotic, with fusion of ideas and experience leading to market innovation", according to Dr Catherine. Besides knowledge transfer across partners, mutual benefits from collaboration include the industry gaining lab resources without much capital investment while the university obtains funds to support its research and expansion initiatives. In addition to research facilities, infrastructure, management and global presence of the university required for collaboration, capitalizing on the differences between industry and academia can nurture successful partnerships.

Industrial research varies from academic research as they focus on solving problems with a real application for the business and to create an "instant" impact on society. The direction of these projects is decided by the corporate heads based on the company needs and the latest trends, unlike academic research that addresses gaps for innovation. With projects measured by the outcomes, the industry research moves at a faster pace by planning and executing alternatives to handle failures contrasting academic research that would dwell on the scientific reason for them. Industrial researchers can provide information on the economics, practical feasibility and environmental impact for the ideas proposed by the academics. Besides the practical experience, they can also contribute to knowledge such as materials that can be easily sourced and are not competing with other processes which could affect economics. As collaboration embraces the differences to promote innovation, it is equally important to balance the expectations of academia and industry.

Defining the nature of research is an expectation to meet the academic requirements for the PhD student working under the collaboration. The academic research requires fundamental science to support thesis while industry research emphasizes the application.

Another expectation is the public disclosure of research with paper publication required for academics to be acknowledged for their work. However, the industry must first protect its work from competitors by filing patents. Depending on the global presence, the industry will prioritise applications for worldwide patents to claim the priority date with a timeline ranging from 2-3 years. Although these may affect academic publishing, prior agreements help to address this with student researchers under collaboration acquiring transferable career skills, including drafting patents and working with industry standards. Other ways to develop a skills portfolio for industry careers are given below.

Often PhD graduates have worked in a specialized research topic thereby lowering their visibility in the industry. However, it is the experience obtained over the journey that enables them for an industry career. According to Dr Catherine, "if you have been shortlisted for an interview, it means that you are needed for the job". The graduates must be open to opportunities and apply their learning agility for industry research. Apart from being an independent researcher and problem solver, graduates must be proactive and know the industry market leaders. Speaking from her experience, Dr Catherine also encourages application for research awards including the Australian Endeavor Research Fellowship Award to expose yourself to interdisciplinary research and expand the skills portfolio for industry. With collaboration as a way to bridge industry and academic research, graduates are encouraged to equip themselves with translatable skills for their careers.

"Collaborations between industry and academia are symbiotic in nature"



Dr Catherine Chang, Arkema Thiochemicals Sdn Bhd

Lighting The Path To Frugal Innovation For Sensors

- Talha Shahid

To do more with less is the essence of frugal innovation which is a strategy to use resource constraints as an opportunity instead of liability*. In the following interview, A/P Dr Narayanan Ramakrishnan tells us his story on the frugal innovation of UV-photolithography machines for in-house sensor manufacturing at his lab.

How did you come about the idea for the machine to do UV-photolithography? What was your motivation to build the machine?

Bare labs greeted me when I started at Monash University Malaysia in 2011 with limited research equipment available for electronics fabrication. With a personal drive to build my own lab, I started creating workbenches with orphan equipment to get PhD students to start researching sensors. Photolithography is a crucial process to fabricate sensors. However, the lack of clean rooms and sophisticated equipment for the fabrication motivated us to find dynamic solutions to our dynamic problems. Our first major breakthrough came from the literature that mentioned the usage of UV LEDs for patterning. We immediately started working on the practicality of the principle and procured low-cost UV-LED torches to fabricate our initial sensors.

With support from the campus and department, particularly Prof. Jussi Parkkinen (ex-Head of Discipline of ECSE), who mentored and encouraged me to set up the lab and the FRGS funding, we acquired momentum for the project. In our "yellow room" instead of "clean room", I transferred my practical expertise to my students, who then started fabricating sensors. We published our initial results and then diversified our research into 2 tracks, one to deal with the development of sensors and the other to build the machine for sensor fabrication. The team then automated the process of mask aligner with image processing and eliminated the lens to build sensor manufacturing machine prototypes over 2-3 years. We also have 4 patents for in-house machines. Our current 3rd generation prototype of the compact UV-photolithography machine costs 90% less than current products down from RM500K to RM60K.

What is the perfect blend for fundamental research and applied research?

You need fundamental research as a platform to initiate your research. It gives you a better understanding of the current research being done and allows you to set your research focus. If you manage to find literature similar to what you were aiming to achieve, it is a positive sign that you are in the right direction and now you just need to go deeper into the science and application. Always think of finding a solution, and think again and again till you manage to do it. It is as simple as that, and you'll always succeed in the end.

What are the challenges you faced in moving from fundamental research to commercialisation?

Actually, the process flow was fundamental research to translation (prototype and patents) and finally commercialisation. In the industry, you have to show completeness, in the form of scalable working prototypes which contrasts the academic research. This results in the challenge of meeting academic KPIs of publications which requires public disclosure of research that conflicts patenting process needed for commercialisation. So we overcame this by "protect prior publishing". However, you can always publish fundamental principles and working methodology. An example from my lab for fundamental research would be the development of sensors for pressure, UV and volatile organic compounds. The results of these studies can be published without giving out detailed information on the methodology. I always emphasise that one should always protect its research first, usually through patent, and then carry on with the publication. Both can work simultaneously, allowing PhD graduate to meet their expectations as well. Another challenge is time management where a lot of time is spent on non-technical stuff like liaising with vendors and third party to get a certain part for the project and coordinating with multiple partners to bring the prototype to reality.

*Source:
HBR - What
Frugal Innovators
Do - Link:
<https://hbr.org/2014/12/what-frugal-innovators-do>

How do you plan to commercialise your inventions?

There are a few options that I can take to commercialise the compact UV-photolithography machine and sensors developed. One option would be to license the patents to companies or find industry partners for commercialisation. The other option for sustained value creation would be to start off a business venture based on feedback received at the Semicon SEA 2019 industry exhibition. The startup could be supported by investors and government initiatives for entrepreneurs. My vision is to bring the compact photolithography machine to the R&D and rapid prototyping communities in universities and industries.

What are the skills that should a student have to be a good researcher?

First and foremost, dedication - sheer dedication and focus will steer you in the right direction towards your goal. Being proactive, persistent and passionate about what you do will keep you motivated to achieve your goals. Be intuitive, curious and have the courage to question assumptions and reason out your work by discussing with peers. The capability to reason and be a good thinker is crucial for a successful researcher. The best way to find a solution to a problem is to "think". Students must hone their thinking abilities by visualising the problem first, identifying the necessity to solve it, building a strong fundamental knowledge base and then finding solutions based on them. Do not hesitate to "think crazily" when brainstorming for ideas and just try them out to see if it works before you make a decision on it. Finally, students must have career goals based on which they make their decisions. I provide 2 options for students at my lab to build their careers with sensor development for those interested in pursuing PhD and hands-on microprocessor based projects for those interested in industry careers.

Do you have any advice for future ITEX participants?

Put out all the best resources you have out there to win at ITEX. Familiarise yourself with the competition guidelines and aim to score maximum points in all categories. Gather all your evidence first and then prepare your presentation by thoroughly addressing all the gaps. The presentation must be clear and simple with bullet points that are easy to grasp for the general public. Give any prerequisite explanations for technical jargon usage using simple analogies, show how commercialisation is possible and lay out the big picture for judges to see.

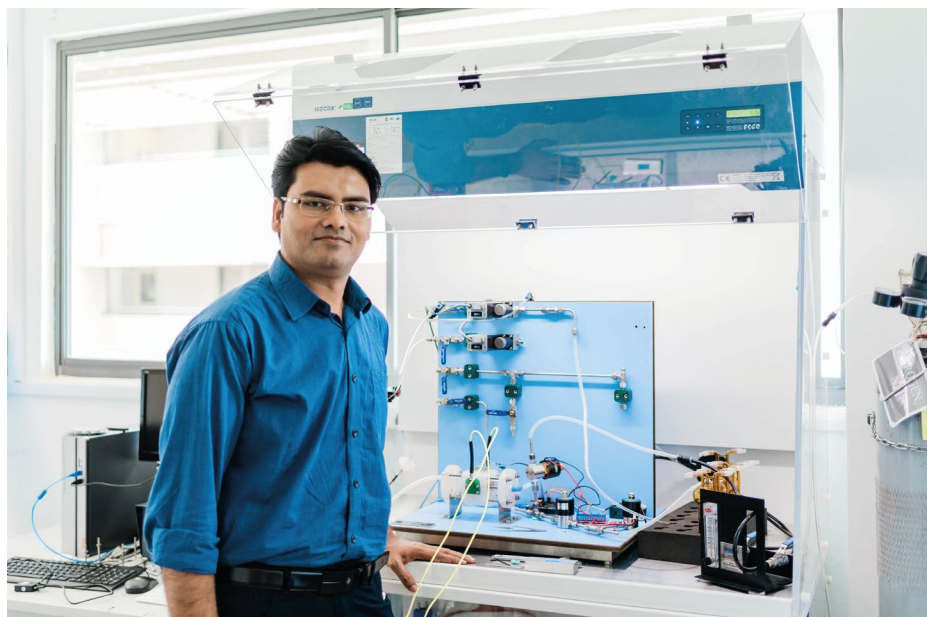
My motto is to be self-sufficient by "do it yourself" attitude and find ways to overcome adversity instead of complaining about it. By never giving up, you will ultimately reach your goal.

A/P Dr. N. Ramakrishnan would like to credit his research team for all the success including Dr. Ajay Achath Mohanan, Dr. Chu Yih Bing, Dr. Tridib Saha, Dr. Mohammad Ali Mohammad Zadeh Kashan, Dr. Lee Neam Heng (Alvin), Ainan Leong, Howgen, Seydiren, Vignesh and all the final year students who have worked with him. He also thanks the Head of School, Prof. Anthony Guo and Head of ECSE A/P Dr Lan Boon Leong for their support. For more information on A/P Dr. N. Ramakrishnan's research, please contact ramakrishnan@monash.edu.

*Source:

HBR - What Frugal Innovators Do - Link: <https://hbr.org/2014/12/what-frugal-innovators-do>

A/P Dr Narayanan Ramakrishnan
Electrical and Computer Systems
Engineering (ECSE) Discipline



Taking The Leap From Applied Research To Commercialisation

- Lee Li Yong

Rapid technological advancement along with growing demands for sustainability calls for faster innovation cycles. Collaborating with industries can enable academia to translate their research effectively and efficiently. Sharing insights from his experience of working in consortiums, Dr Daniel Kong takes us through the challenges faced on the path of commercialising applied research to pilot scales.

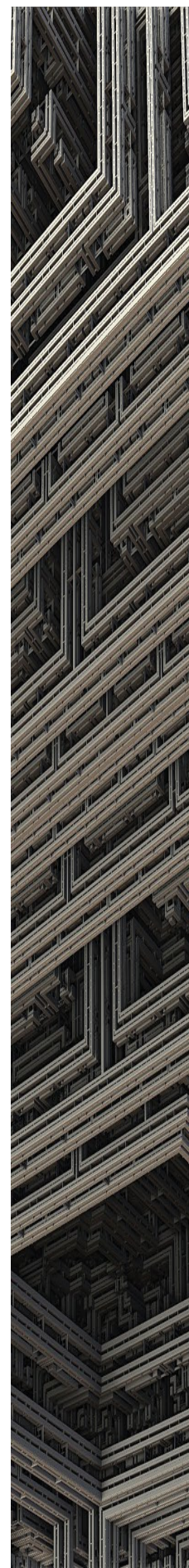
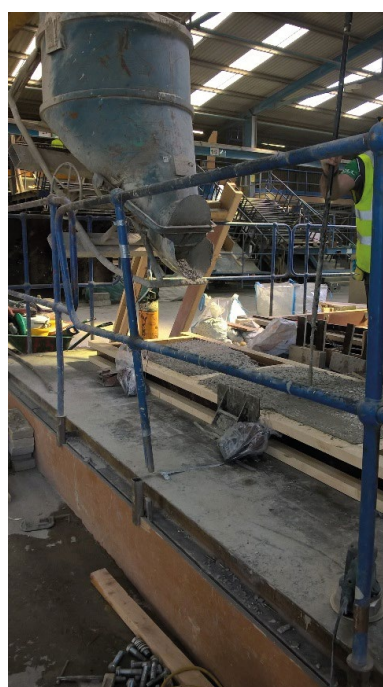
Academic research is for the creation of scientific knowledge while the industry is more application-oriented and commercially driven. Expectations stemming from these operational differences introduce the challenges faced during collaborations. Industry collaboration involves unconventional and applied research where everything that was done in the laboratory must be translatable to large-scale production. Unlike the independent and autonomous academic research environment, industry collaboration involves a lot of coordination in order to complete the project. An example would be halting production lines in a plant to accommodate research thereby affecting operations with downtime for the industry. Moreover, the industry expects outcomes in the short term in contrast to long term studies found in academic research. Additional concerns arise when projects involve international collaborators with differences in time zone, culture and skilled labour introducing delays in the project execution phase. Most of these challenges can be overcome by communicating priorities and clarifying expectations at the research agreement phase including addressing any intellectual property related concerns. Besides these challenges, the complexities of collaboration need to be understood well to handle the project successfully.

The project complexities emerge from different aspects including technical, political, economic and environmental to name a few. While technical complexities deal with the practicality and feasibility of large scale production with legal licenses to be in place, the economic complexities deal with the costs of research translation and implementation. The political complexities involve changes in industry trends and potential competitive business threats. In addition to these complexities, the project may face failures and uncertainties during implementation such as negative results, knowledge transfer and staff departure. By having the project tasks handled in teams and risk mitigation measures in place can help to deal with uncertainties. Communication is another crucial tool to mitigate the complexities and uncertainties with monthly regular progress meetings with the industry collaborators and reports at the major milestone reviews. As the projects include students working for the outcomes, training them to understand the complexities of the project and to work in the fast-paced environment is a requisite.

“A successful collaboration enables the effective translation of academic research”



Large Scale production of the “LowCoPreCon” concrete



Feature

As industry collaboration is very different from the conventional academic research, the students must acquire communication skills. The students should also learn about the industry standards, working culture and effective time management to ensure project outcomes. Involving in industry collaboration exposes the students to get a sense of the real world and learn something beyond their lab bench. They can even learn the practical construction issues from the construction site managers and engineers, thereby expanding their research capabilities and skills portfolio. New skills developed can include producing engineering drawings and working on site according to industry standards. Moreover, students can develop their business sense and think holistically from different perspectives. Getting exposed to real-world projects is a rare practical experience for students as they can get involved in the actual construction of a bridge in a research project.

A successful collaboration enables the effective translation of academic research. However, engaging the industry is a challenge on its own. The collaborative relationship must be built by understanding the industry's point of view and their ethos. Starting with small collaboration projects to feel out the industry culture would help to understand the ethos before engaging in large-scale collaboration. Networking at exhibitions, talks, conferences and networking events by technical societies (Institution of Engineers Malaysia and Engineers Australia) with the intention to understand the industry will also assist in increasing profile visibility for collaborations. The industry grants are an indication of current trends along which the academia can align their research initiatives. Research commercialization via industry collaboration is an effort worth making to see the real-world impact of your work on the society around you.

The collaborative projects being handled by Dr Daniel Kong include the "LowCoPreCon" cementless concrete and solar paving solutions as sustainable alternatives to current technology used. For more information on these projects, please contact Dr Daniel at daniel.kong@monash.edu



Dr Daniel with his collaborative team at the industry visit

Getting Monash Researchers Connected With Industry

- Lee Li Yong and Yasmin M.Z.

With its status as one of the leading research universities in the region, Monash University Malaysia is collaborating with industries to translate the lab innovations and bring them to the market. As the External Engagement Manager at the School of Engineering (SOE), Ms Nalni Devi Subramainam works to expose and showcase our technical expertise to industries. Here, Ms Nalni shares about the challenges faced and initiatives by SOE for research translation and commercialisation.

Working in my field here in SOE, the crucial step to forge industrial collaborations is to have mutual ground for partnership by understanding of each other's needs and differences. The transition from fundamental to translational research is important for our researchers to have a real-world impact. By nature, industries are keen to approach researchers with feasible prototypes that have proven concepts and application. Moreover, acceptance for new technology requires the industry to take risks and accept transition changes in their processes and technology, with smaller start-up companies more willing to take these risks. On the other hand, promoting the creation of

intellectual property (IP) necessary for commercialisation is a challenge in research institutions where academic publications are a priority. A strategic move by SOE towards research translation would help us to overcome these challenges while providing more engaging communication and knowledge exchange with industry.

Industrial collaborations also benefit the students as they can work closely with the industry and get exposed to real-world problems. The hands-on experience and problem solving skills gained from industry collaborations will fulfil the needs of future employers who are looking for application-oriented employees. The School is also looking into industry partnership in-line with the current trend and demand of digital technology in The Fourth Industrial Revolution (IR 4.0).

For enquiries related to industrial engagement at School of Engineering, please contact Ms Nalni at nalnidevi.subramainam@monash.edu.

Introducing New Academic Staff



Name: Dr Tan Wen Shan

Department: Lecturer at Mechatronics Engineering, Monash University Malaysia

Expertise: Optimisation algorithm, artificial intelligent algorithm, smart grid, power system planning and operation, renewable energy integration, energy storage, demand response and electricity market operation

Ongoing/Completed Projects:

- Optimising Distributed Generation Planning Using Hybrid Artificial Intelligent Approach
- Flexibility-Based Scheduling of Variable Wind Power with Conventional Generation and Non-Generation Resources
- Economics and Reliability-based Design for an Offshore Wind Farm (in collaboration with Prof Dr Allen Wu from National Chung Cheng University)
- Multi-timescales generation scheduling (MTGS) for electricity market operation

Contact: tan.wen.shan@monash.edu

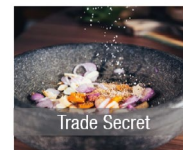
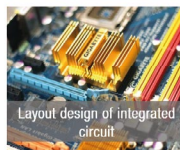
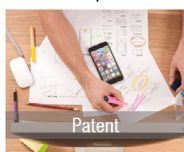
For more information, please visit <https://bit.ly/2G0GQpK>

What Should You Do To File A Patent?

- Yasmin M.Z.

Intellectual property (IP) are *creations of the mind* protected under the IP laws. There are multiple types of IP as shown in the image below. Patents are the most widely used IP among engineering researchers. In this article, Ms Tan Siao Ping from Campus Research Management (CRM) shares information on patent filing and the support available for Monash researchers and postgraduate students to file for patents.

A typical patent filing cycle at Monash University Malaysia starts with invention disclosure to the CRM with an application processing time of 3-4 weeks. Field experts and evaluators from the schools are nominated to assess this application. Once the application is approved by the chair of IP committee, CRM will engage with external patent agents to draft the patent specifications.



Different Types of Intellectual Property

A patent protects innovation including concepts, logical ideas and prototypes. It depends on what stage the product is and the need for a patent application, whether for commercialisation or further development. There are three preliminary conditions to be met before filing for a patent as given below:

1. The idea must be new with the invention not publicly disclosed anywhere in the world
2. The idea must involve an inventive step, that is not obvious to someone with knowledge and experience in the field.
3. The idea must be industry applicable and can be mass produced.

Similar to owning a property like a house, IP can also be transferred (*sold*) or licensed (*leased*) to a third party to commercialise the invention. Another option to commercialise patents is to self-manufacture the product and start a business venture. Owning a patent gives the inventor the right to make that product and to take legal action against those infringing the rights. Patents give the inventor an edge over the competitors, adding value to the product and giving confidence to potential investors.

It is then submitted to the Intellectual Property Corporation of Malaysia (MyIPO) which may take up between 5-7 years for the results of the patent examination to come out. Patent filing can be expensive with high costs incurred for filing international patents and maintaining the granted patent subject to its renewal. A patent filed with MyIPO is only applicable in Malaysia. The international patent application within Monash University is considered on a case by case basis, especially when external collaborators are involved. The researchers must provide market research and prepare a business paper to show the patent's commercial value abroad. As time is crucial for patent filing, it is worthwhile to plan your patenting needs. A few common concerns for researchers include prior art information and "patenting vs publishing" which have been addressed by Ms Tan Siao Ping below.

"Prior Art" is information that has been made available to the public in any form before a given date, and is one of the most common reasons why patent offices reject claims in patent applications. Prior art is important because if it discloses or suggests the invention, then the invention is not considered new and the prior art disqualifies a patent from being granted to the invention.

Any publication such as a brochure, a magazine article, a published patent or patent application, advertising, a web page, a thesis, or instructions that accompany a product around the world and in any language may be considered a prior art disclosure depending on the circumstances. Researchers are always encouraged to do their own patent searching to ensure that they produce state of the art inventions, assess their patentability potential and avoid reinventing the wheel. Google Patent, Espacenet and the Derwent database are good places to start the search for prior art.

Another common concern with researchers is that the time required to get a patent will affect journal publications and vice versa. However, the fact is that the two processes can be done concurrently. A patent application can be submitted whilst preparing to publish a paper. All the information that will be submitted for publication, can also be included as an attachment of the invention disclosure form (IDF) for patent application.

Patents can be internally assessed and filed with MyIPO in parallel with drafting papers for publication. However, it is always safer to apply for a patent first, then proceed with journal publications to avoid any prior art related issues. If there are any external collaborators, it is important to take note of the IP clause in the research agreement.

Monash researchers can attend talks, workshops and consultations conducted by CRM to understand about IP. MyIPO also offers related training workshops. For more information, log on to www.myipo.gov.my or contact Ms Tan Siao Ping (tan.siaoping@monash.edu) from Campus Research Management for further enquiries.

Academic vs Industry Grants: Tips to Secure Them

- Ir. Dr. Mohd Zulhimi Paiz

Research funding is necessary to cover the research expenses including students' allowance, consumables and equipment. Writing a winning proposal is the key to secure funds. Researchers must study the nature and expectation of each grant before writing their proposal. Some tips to secure grants is given here.

Academic Grants

Academic grant is provided by the government or its agencies where the funding comes from the public. The nature of the funding is typically related to fundamental studies. Besides a clear and succinct proposal, include the following elements to help you secure an academic grant:

- Target audience: Understand the target audience (reviewer and nature of the grant).
- Novelty: Include contributions to the field.
- Sound approach: The objectives and methodology must be clear and feasible.
- Contribution: Highlight the project's importance and how it contributes to the government or supports its policy.
- Reasonable budget: Only budget according to project requirements and justify them with details.
- Output: Typically, this will be in the form of journal publication, participation in a conference or other sharing avenue.

Industrial Grants

Industrial grants are typically funded by private entities. The nature of the project is based on applied research towards technological development, proof-of-concept, process improvement or commercialisation, which will drive the industry. The fact that industrial grant typically focuses on applied research does not imply that it will not cover fundamental research. Unlike academic grants, the industrial grant application is assessed based on its potential and extent of its benefit to the industry. The following elements are some of the essential criteria for an industrial grant proposal.

- Understanding the problem: It is crucial for you to conduct an initial discussion with the industrial partner to understand their problems
- Market study: The industry is always interested to see the market size and how they can benefit from the technology.
- Cost-Benefit Analysis: The economic analysis of the project feasibility should be included.
- Timeline: A typical proof of concept project will be between 6 – 12 months. Plan your project carefully to make it attractive for industry to invest.
- Networking discussion: Involvement with the stakeholders is a must to seek feedback, requirements and to reduce the project risks.

Research Focus

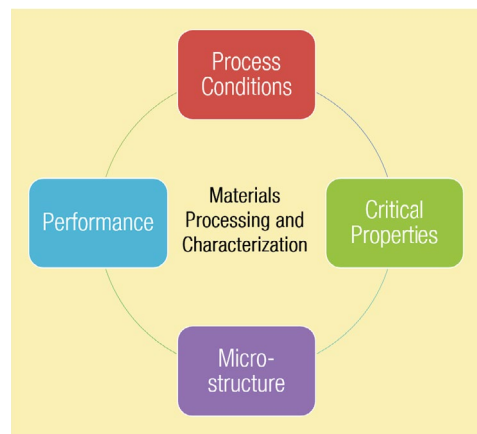
- Yasmin M.Z and Lee Li Yong

As a premier engineering school in Malaysia, the School of Engineering at Monash University Malaysia promotes innovation in applied research via industrial collaboration. Few of the ongoing collaborative projects have been highlighted here. Based on the interviews with our academic staff, we focus on the real-world problems being solved, the challenges to overcome and the student skillsets developed under the collaborations.

Dr Arshad Salema

We have two collaborations at present, one with Sunway BRT line and the other with Sime Darby Plantation. For the BRT project, we are investigating the techno-economic feasibility of using solar energy to charge the electric bus. This is to change the dependency on the fossil fuels. For the Sime Darby collaboration, we are helping to find optimised solution to sterilise the fresh palm oil fruits in a microwave technology to replace the conventional steam based method. The biggest challenges that I faced was to convince the industry to work with us and invest in the project. To overcome this, first we need to understand the problem faced by the industry and then bring our expertise into it. We need to gain trust of the industry to build a synergistic relation. In order to convince the industry, we must analyse the positive impact to them with our proposed methods, estimate the economics and come up with the end product concepts. To balance expectations, a mutual understanding between both parties is important. We can sign a Non Disclosure Agreement (NDA) at the initial stage and proceed with a Memorandum of Agreement (MoA) later on if we see that the project can produce viable outputs including publications. Although students face short timelines under these projects, they learn to adapt, be proactive and equip themselves with skills to apply in the real world.

To know the application is one thing but to see the real application is something else. In order to cope in the fast paced environment, students need to be independent researchers and become problem solvers. They have to be “thirsty” and eager to learn everyday with the ability to work without protocols. Being exposed to “practical execution troubles” enable the students to improve and grow their skill sets for future careers.



A/P Pooria Pasbakhsh

Building on my existing relations with Hard Shell, I started the collaborative project to reinforce the thermal and mechanical properties of polyurea based polymer composite. The fast curing polymer will be used as self-healing hard coatings in the construction industry and marine structures. One of the challenges that I face is time management. In academia, you have a few years to complete a project but in the industry you need results now. Another challenge is the project outcomes with industries needing to commercialise the end-product within stipulated time of 1 to 2 years. This would add additional challenges when publishing academic papers. I overcame this challenge by building on existing company patents to develop commercial products while defining sub-objectives to encourage students to publish new findings and/or writing review papers. Students researching under this project get to experience the entire cycle of materials development unlike the focus on a single stage of the cycle as often found in academic PhDs.

Prof Khu Soon-Thiam and Dr Amin Talei

Our project is focused on improving water quality in South Quay by using nature-based solutions. In this project, a system consisting of a group of biofilters and retention ponds were designed to treat the drained water from nearby residential and commercial areas prior to its discharge into the South Quay lake. The biofilters are landscape depressions or shallow basins which are meant to promote on-site treatment of stormwater. They consist of few layers of engineered sand-based media and vegetation on top. This nature-based engineering solution can promote a sustainable water quality enhancement through filtering out the pollutants. We first carried out several site investigations and water sampling from the lake, its surrounding ponds, and the entering drains. After an in-depth data analysis, we designed a chain of biofilters and retention ponds to be constructed by Sunway Group.

In addition, retrieving plans were also proposed for the existing ponds to enhance both treatment and aesthetic aspects of their function. After finalising the construction drawings by Sunway Group, the construction of the proposed system is now in progress. The challenges that we had and perhaps any researcher who want to work with industry may face, were: (1) to understand the needs of industry, and (2) to propose a practical and cost-effective solution. It is worth mentioning that time management in industry projects is the other challenging factor. We need to understand that constraints such as getting approval from authorities or dealing with subcontractors may delay the progress of the project. In this project, few Final Year Project (FYP) students got involved where they needed to have steep learning curve to meet the industry's requirements and comply with the project constraints. These students had the chance to experience the transformation of theoretical aspects of a research project into the practicality aspects of its implementation in real life. This was also an opportunity for them to expand their career networks by working with several departments of a company. With regards to balancing academic expectations for publication, we faced no challenges as we have published the results obtained from prior prototype studies in the lab and greenhouse. However, any future publication on this specific case study is subjected to the agreement of our industry partner due to the data confidentiality.

Dr Veera Ragavan Sampath Kumar

Fourth Industrial Revolution (4IR) has brought about a paradigm shift in the way we design factories of the future. Engineering system design and re-engineering of processes incorporating Automation, Robotics, and Internet of Things and Services into the design are some of the areas that I explore for research. Cyber-Physical System design, one of the core pillars of the Fourth Industrial Revolution (4IR), is gaining traction in Malaysia with impetus from the government's #Industry4WRD program.

Our projects aim to enable Small-Medium Enterprises (SMEs) to leapfrog from their current setup to IR 4.0, thereby enhancing their productivity in the competitive market. We address this by bridging gaps in terms of understanding, concepts, workforce, and providing customized CPS solutions. It is crucial to customize CPS solutions for SMEs in Malaysia as the generalised "one-size-fits-all" solutions offered by consulting firms are uneconomical and may not be the right fit for them. The significant challenges in executing such industrial projects are to manage expectations and address knowledge gaps of team members (including the students) working on the project with an additional challenge of a nascent research culture in the Malaysian industry. The industry expectations include industrial-grade solutions to non-standard problems at a level developed by system integrators but at low cost and quickly.

On the other hand, are the government expectations of Human Capital Development and the academic expectations of research publications, innovations in teaching, and managing resource constraints. Furthermore, 4IR Project Team (especially mechatronics students) face the steep learning curves due to the interdisciplinary nature of projects involving mechanical, electrical, and Information Technology aspects. Managing these expectations is only possible through effective communication, a formal requirements analysis, clear definitions, precise project scope, and deliverables management. Last but not least, our students get an opportunity to build realistic and functional prototypes, thereby adding valuable skills to their portfolio.

A/P Vineetha Kalavally

There is more to light than we see. Studies have shown that light impacts humans through a non-visual track in addition to the visual track typically used to see things around us. In fact, light entering the non-visual photoreceptor is the key stimulus that regulates our circadian rhythm and consequently our sleep-wake cycle. It is well known that many physiological effects relating to hormone production and psychological effects such as concentration and alertness are dependent on the health of our sleep wake cycle. This is why our research focuses on human-centric lighting, where we explore the effects of light on human function and health and translate the results to provide direction to the lighting industry on luminaire and lighting design. From the fundamental perspective, we are developing mathematical models to accurately represent this phenomena, i.e. the effects of light on the human circadian. We also conduct psychophysical experiments to gauge the extent of psychological impact of light which has undergone spectral shaping to enhance its properties. At the translational level, we work with our industry partners to design lighting products which are informed through research, particularly integrating the new knowledge on non-visual effects of light. Even Multinational Corporations (MNCs) that are heavily invested in research are keen to collaborate on research leading to findings for the Malaysian context. One of the challenges we face in our industry projects is the challenge of delivering milestones, especially when prototyping hardware or seeking ethics clearance for experiments where humans are involved. With MNCs focused on exploring the Malaysian context to design their products, timelines are slightly more flexible. However, for the local Small Medium Enterprises (SMEs), timely delivery of outcomes is needed to face the competitive market. As the projects are multidisciplinary, including fields such as color science control systems, psychology, radiometry, photometry, machine learning and hardware development to name a few, students are required to develop and share related skills in the research group. Communication with industry is another essential skill for students in our lab. As the time spent under artificial lights each day is steadily increasing for most humans, we envision commercialisation of human-centric lighting to promote better health.

Congratulations to Our Research Graduates!



- A/P Dr Poh Phaik Eong

In the most recent graduation ceremony (6th April 2019), we have four GRS in the procession (in no particular order) as below:

- Dr Lee Neam Heng (Award conferred 4th Dec 2018)
- Dr Loke Chai Yee (Award conferred 19th Feb 2019)
- Dr Low Liang Ee (Award conferred 24th Oct 2018)
- Dr Tan Hui Min (Award conferred 19th Feb 2019)

Let's congratulate and wish them all the best in their future endeavours! Looking forward to the next batch of graduates in November 2019.

Competition Three Minute Thesis 2019

Often as researchers, we communicate our findings to experts or researchers in our respective fields. However, how many of us are able to explain our research to the general public with layman language in a concise manner? Three-minutes thesis (3MT) competition gives you precisely 3 minutes to articulate the impact of your research in a way that the general public can comprehend using a single image presentation slide.

In 2019, the School of Engineering (SOE) has conducted 3MT competition differently. The component of 3MT is embedded in ENG6009 Communicating Research in Engineering, as part of an assessment, training enrolled students to present confidently to the general public. Prior assessment, students were given lectures on oral presentation and chance to practise via workshop activities. It is envisaged that the introduction of 3MT assessment in ENG6009 will expose more students to such meaningful activity and to encourage them to refine their presentation skills.



- A/P Dr Poh Phaik Eong

The assessment in ENG6009 was used to determine the finalists to compete in the School of Engineering 3MT competition that was held on the 30th of April 2019. The judges included A/P Dr. Poh Phaik Eong, Dr. Alpha Agape Gopalai and our successful past 3MT winner of Monash University Malaysia Campus -- Dr. Tridib Saha.

The final results of SOE 3MT competition are as follows:

- First place: Mr. Janarthanan Supramaniam (CHE)
- Second place: Mr. Christian M. Bongard (CHE)
- Third place: Mr. Jeshaiiah Khor Zhen Syuen (TRC)
- Fourth place: Mr. New Eng Kein (CHE)
- Fifth place: Mr. Loo Nien Loong (MEC)

As the SOE representative, Mr. Janarthanan won the 3MT Monash University Malaysia Campus round conducted on 30 May 2019 with his topic "Multifunctional Filler For Self-Healable Rubber!". He will be participating at the Monash University 3MT® Final in Australia for an opportunity to compete in the Asia-Pacific 3MT® Final at The University of Queensland. We congratulate and wish Mr Janarthanan good luck for the finals in Australia!



Congratulations to Our ITEX 2019 Winners!

Organised by the Malaysian Invention and Design Society (MINDS), ITEX 2019 was held from 2nd to 4th May at the Kuala Lumpur Convention Centre (KLCC). Awards were conferred to inventions that were judged based on the following criteria: novelty; inventiveness; usefulness and application; presentation and demonstration; market and commercial potential; and environmental friendliness. Research teams from our School of Engineering won multiple awards at ITEX 2019 as highlighted below.



Asian Invention Excellence Award 2019

World's First Compact Photolithography Equipment to Manufacture Electronic Chips

A/P N. Ramakrishnan (PL), Dr Lee Neam Heng,
Tay Jian Zhen & Howgen Pratama Kesuma



Gold Award

World's First Compact Photolithography Equipment to Manufacture Electronic Chips

A/P N. Ramakrishnan (PL), Dr Lee Neam Heng,
Tay Jian Zhen & Howgen Pratama Kesuma



Gold Award

World's First UV Dependent Piezo Capacitor: An Electronic Component Suitable for Wearable UV Sensing Applications

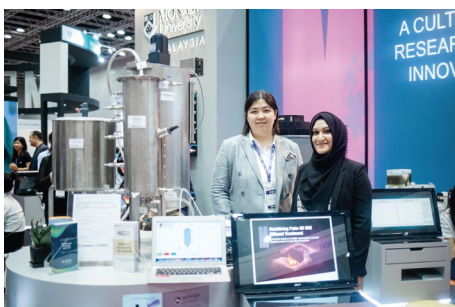
A/P N. Ramakrishnan (PL), Yun Mun Lim, Dr Mohammad Ali Mohammad Zadeh Kashan, Dr Tridib Saha, Seydiren Seeneevassen, Dr Ajay Achath Mohanan & Tharmaa Varatharaja



Silver Award

Robotic Indoor guide for Vision-impaired Persons

Dr Patrick Ho Wan Chuan (PL), Ir. Dr Joanne Lim Mun Yee, Ricky Sutopo, Pong Loong Yeat, Claire Jewel Wong Mae Mae, Calvin Low Fu Yuan & Soo Kuo Yi



Silver Award

A complete solution to resolve stability issue of thermophilic anaerobic digesters for palm oil mill effluent treatment (POME)

A/P Poh Phaik Eong (PL), Dr Tan Hui Min, Sabeeha Nushrat Bibi Aisha Khadaroo & Dr Darwin Gouwanda



Silver Award

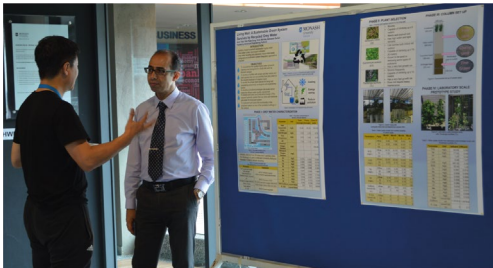
Light-Driven Visual Inspection System

A/P Vineetha Kalavally (PL), A/PKuang Ye Chow, Sanush Khyle Abeysekera, A/P Melanie Ooi Po-Leen, Luvin Munish Ragoo & Maria Natividad Tejada Casado

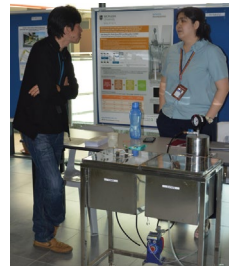
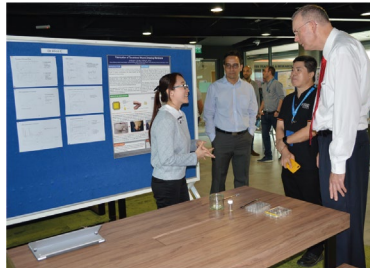
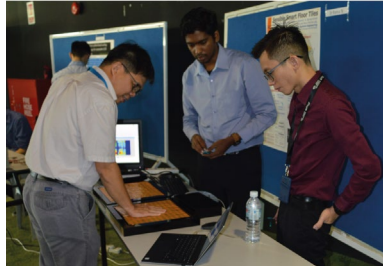
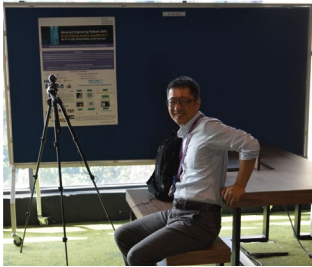
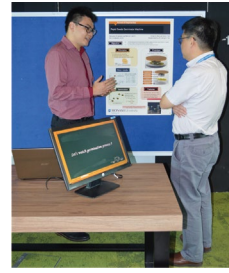
Sustainable and Smart Living Lab S2L Exhibition 2019

The Sustainable and Smart Living (S2L) Exhibition was hosted by Advanced Engineering Platform (AEP) at Monash University Malaysia on 5th April 2019. The exhibition showcased the outcomes (completed and on-going) of the projects supported by AEP for the last three years. The following projects were showcased at the event.

Project Leader	Project Title
Associate Professor Narayanan Ramakrishnan	Smart Floor – the floor with sense and energy
Associate Professor Hung Yew Mun	Effective carbon-based spray-cooling technique for sustainable LED lighting
Dr Chang Wei Sea	Organic Solar Photovoltaics - from sunlight to electricity utilizing the potential of zinc oxide
Dr Abdus Samad Kamal	Cooperative vehicle and traffic control systems for smart city transportation network
Dr Jin Zhe	Two-factor authentication using face biometrics and QR signature for access control in smart home environment
Dr Tan Ming Kwang	Development of a novel technique to accelerate water uptake and sprouting of seeds/beans via MHz vibrations.
Dr M.E. Raghunandan	Development of a bi-functional vibration control layer for road paving blocks
Associate Professor Chong Meng Nan	Development of an innovative plumbed rainwater system with treatment train for sustainable urban water management in Malaysia
Dr Amin Talei	Living Wall: A sustainable green system survives by recycled grey water
Associate Professor Poh Phaik Eong	Biopolymeric membrane filtration system for greywater treatment and reuse in residential building
Dr Daniel Kong	Thermo active building cooling systems
Dr Lee Chern Leing	The embedment of highly conducting microcapsules impregnated with Phase Change Materials as a natural thermal regulator in a moving vehicle
Dr Pushpamalar Janarthanan	Sustainable biodegradable carrier bag from palm oil biomass
Dr Darwin Gouwanda	Intelligent food waste anaerobic digester for urban environment
Dr Surya Nurzaman	Prototyping soft grippers for fetch and carry robots
Dr Alpha Agape Gopalai	Design and development of a wearable system for kinematic gait parameters prediction
Associate Professor Vineetha Kalavally	Smart and Sustainable Lighting
Dr Alice Chuah	Fabrication of tocotrienol wound dressing membrane
Dr Patrick Tang	Development of smart rubber glove with rapid self-healing of pinhole defects



Event Highlights



Student Tips: How to Deal with Uncertainties in Research

"Be curious, always ask questions until you fully grip the fundamental knowledge. Innovative ideas always spring when you communicate with your supervisors, peers or even colleagues from other disciplines. Be open to exploring, open to new perspectives and positive criticism, it only helps you improve yourself. Do what you love so that you enjoy and have fun when you work."

- Howgen Pratama Kesuma, PhD student

"My personal driving force to do research was curiosity to see whether the idea works or not. You must love and have a passion for what you are working on. Time management is important - expect and account for delays. Projects are teamwork which requires you to be proactive and build good working relations with the team for effective results."

- Lim Yun Mun (Eason), Year 5 ECSE student

TED Talks on Collaboration

1. Build a Tower, Build a Team - Tom Wujec
<https://bit.ly/1PWH144>
2. Where Good Ideas Come From - Steven Johnson
<https://bit.ly/1RcxngY>
3. How I repaired My Own Heart - Tal Golesworthy
<https://bit.ly/2LXT5XV>
4. What Physics Taught Me About Marketing - Dan Coble
<https://bit.ly/2LozaBR>

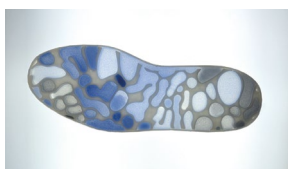
Short Reads For You

1. Industry-Academic Partnerships Can Solve Bigger Problems <https://bit.ly/24uihpq>
2. Innovative Companies Get Their Best Ideas from Academic Research — Here's How They Do It
<https://bit.ly/1VBI3pU>
3. Why Companies and Universities Should Forge Long-Term Collaborations <https://bit.ly/2DxBAXk>

Source: Harvard Business Review

Did You Know?

The following products were the result of open innovation by collaboration of industries with public including universities participating in the product development process.



Deep Learning Insoles based on bio-design - Puma and MIT Design Lab



Patch Antennas for Unmanned Aerial Vehicles - Boeing and University of Victoria



Yervoy - Melanoma Drug - University of California, Berkely and Bristol-Myers Squibb



Huggable - Social Robot for Pediatric Care - Boston Children's Hospital, MIT Media Lab and Northeastern University



Raven - Surgical Robot - University of Washington, University of California, Santa Cruz and Neurosurgeons



Street Scooter - Open Source Electric Vehicles - RWTH Aachen University and ~50 companies