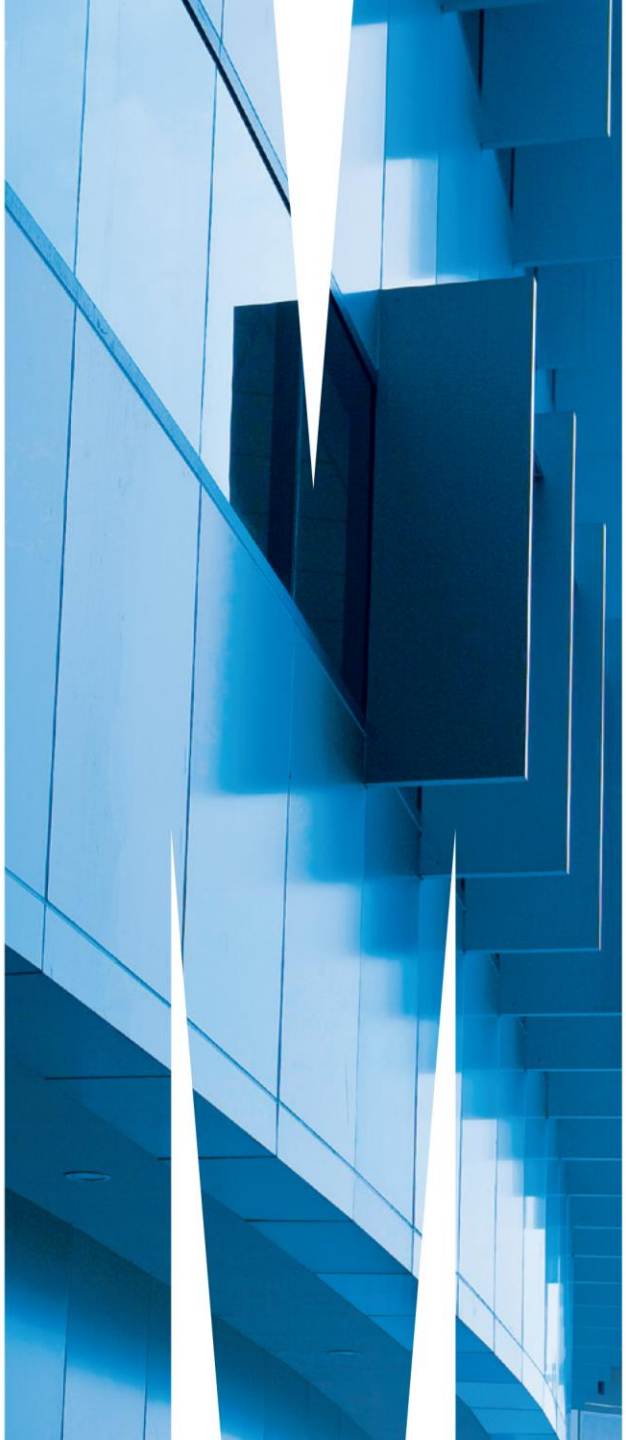
MONASH University
MALAYSIA

Monash University Malaysia: Embracing challenges and seizing opportunities of the 4th Industrial Revolution

Tan Chee Pin
Associate Professor
Head of Mechatronics Engineering discipline
School of Engineering
Monash University Malaysia

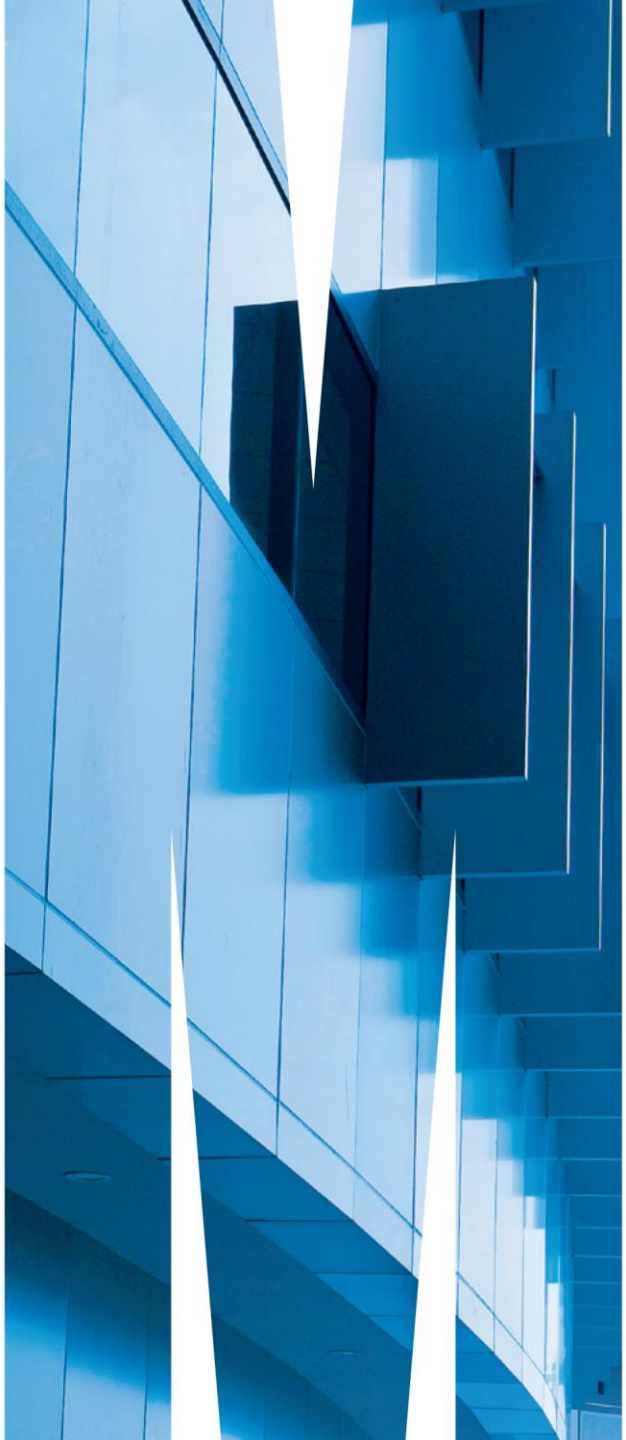


Monash University Malaysia is a joint venture
Jeffrey Cheah Foundation | MONASH University

MONASH University
MALAYSIA

Monash Malaysia was set up in 1998 as the first Foreign University Branch Campus in Malaysia, and it has 7 Schools and over 8,000 students. It is rated in ***SETARA*** Tier 6 in 2017.

Mission statement: Monash Malaysia offers an internationally recognised Australian education, enriching the student experience and employability through educational innovation, high impact research, student mobility, social entrepreneurship and industry engagement.



Monash University Malaysia is a joint venture

Jeffrey Cheah Foundation | MONASH University

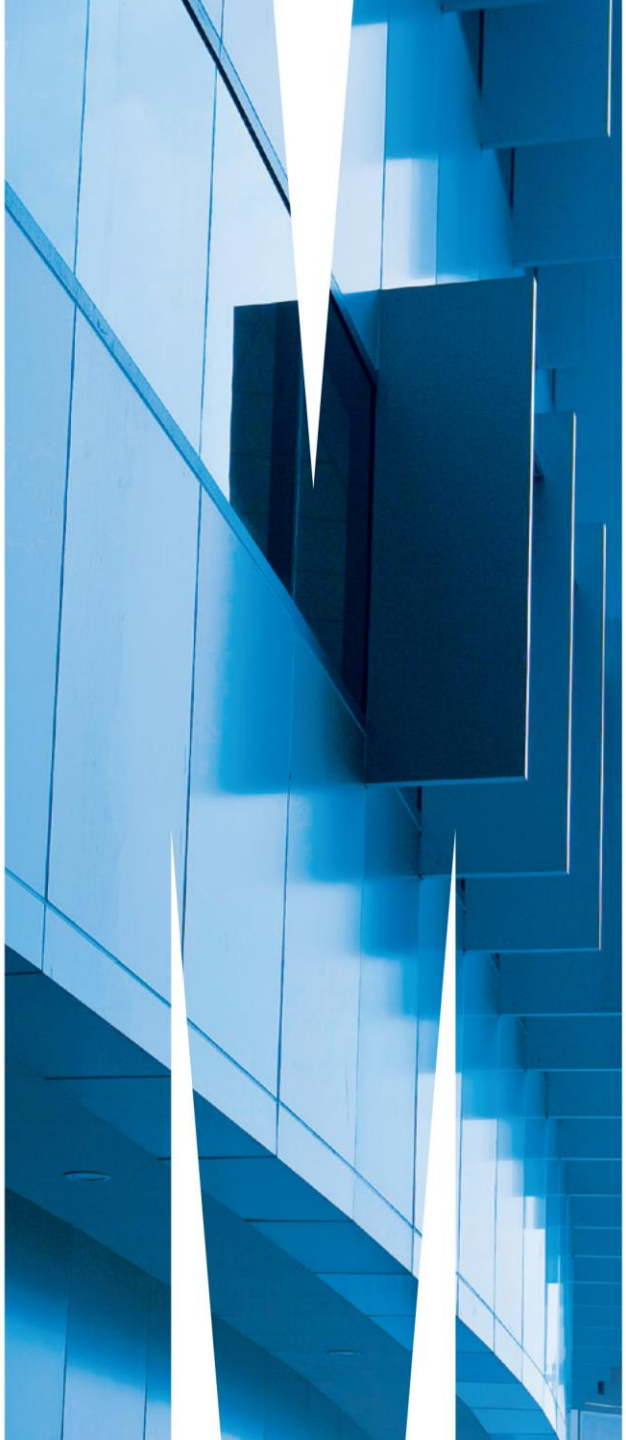
MONASH University
MALAYSIA

SWAKREDITASI
SELF-ACCREDITATION
MQA/SA/0005
MULAI/SINCE: 2010

SELF-ACCREDITING
PRIVATE UNIVERSITY

6 SETARA-2017
Mature University
OUTSTANDING

RATED TIER 6
by the Ministry of
Higher Education, Malaysia



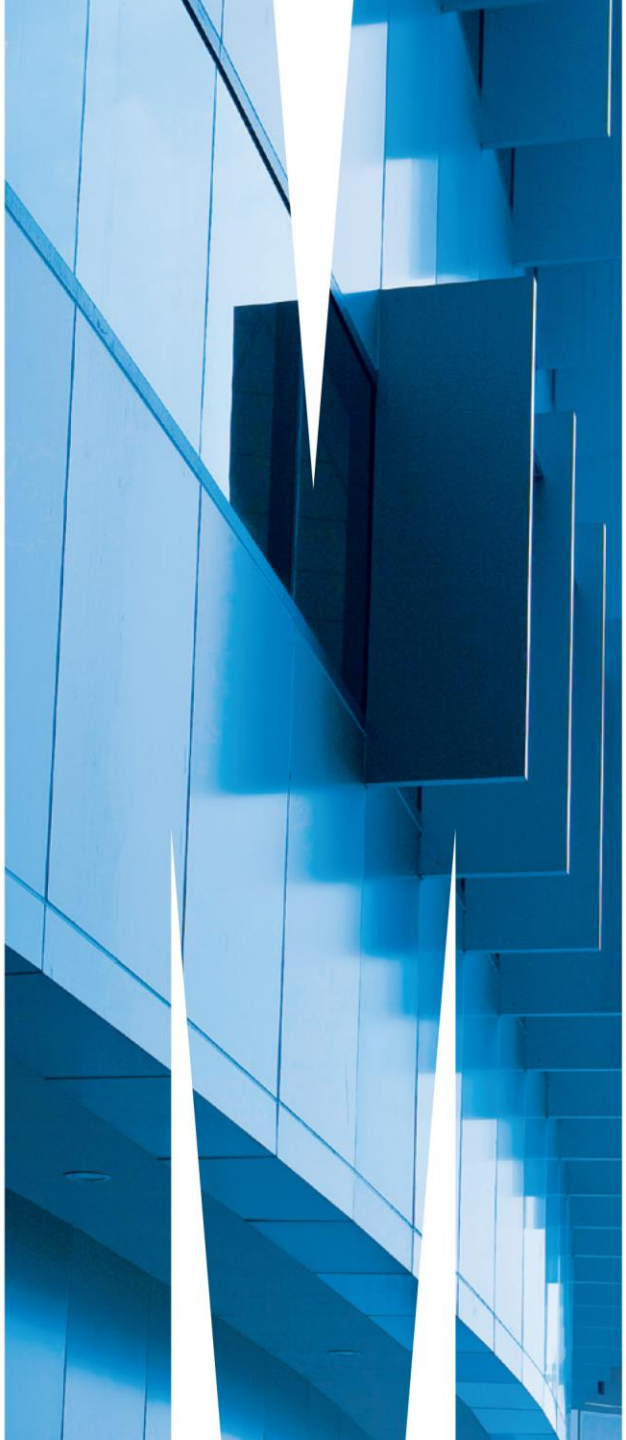
Monash University Malaysia is a joint venture

Jeffrey Cheah Foundation | MONASH University

MONASH University
MALAYSIA

As the Malaysian campus of a premier research-intensive Australian university, we are **Monash's platform for scholarly engagement with the Southeast Asian region**.

RM 8.85mil
OBTAINED IN EXTERNAL RESEARCH FUNDING (2018)

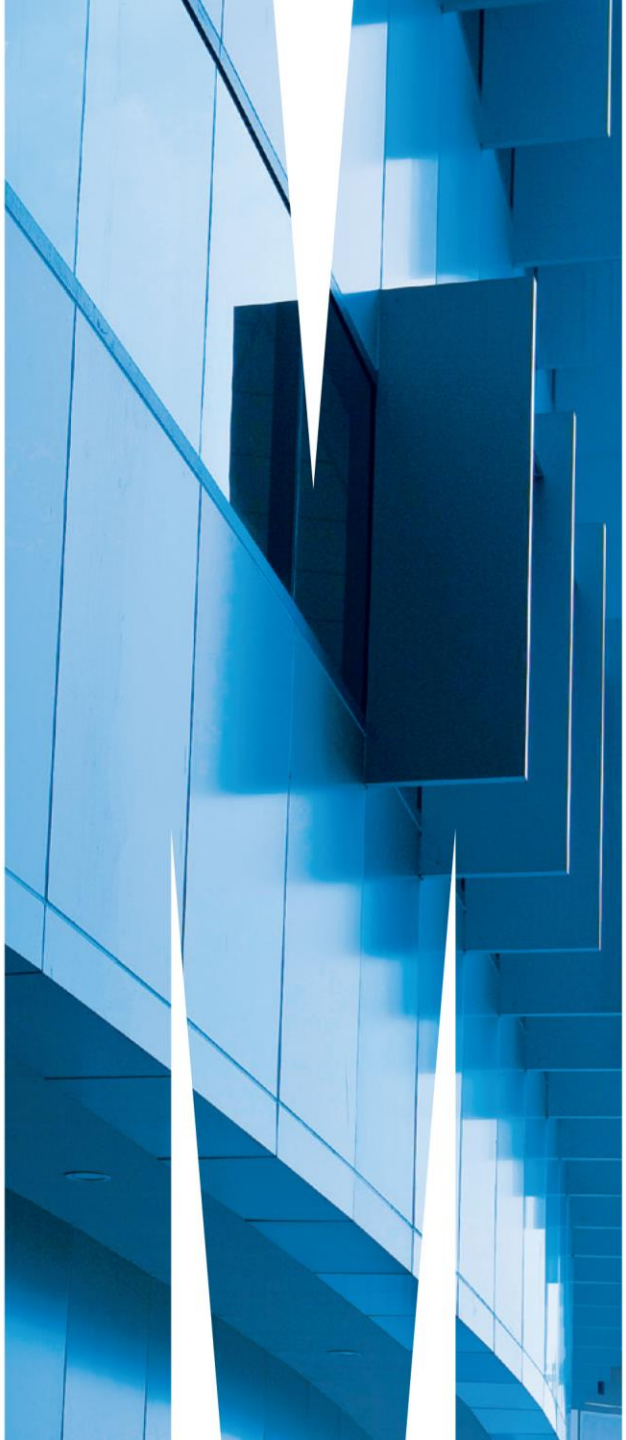


Monash University Malaysia is a joint venture
Jeffrey Cheah Foundation | MONASH University

MONASH University
MALAYSIA

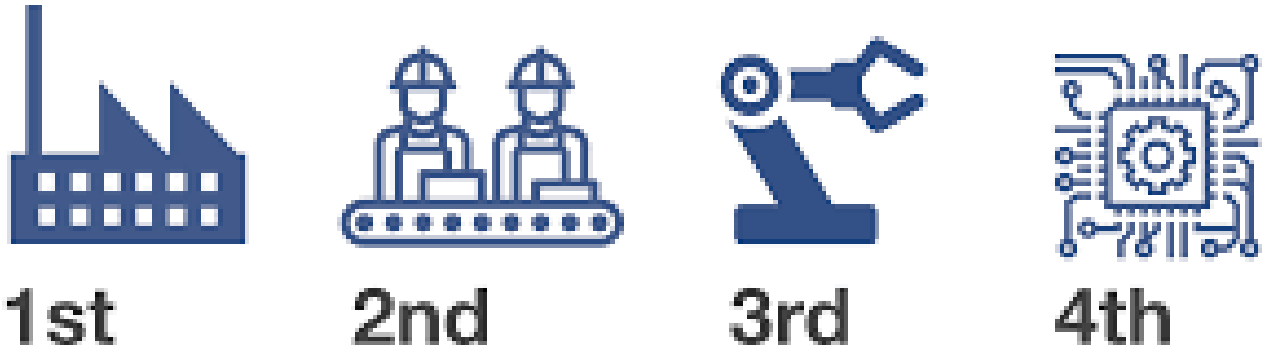
School of Engineering

- One of the 7 Schools at Monash Malaysia
- One of the departments in the Faculty of Engineering of Monash University
- Six BEng (Honours) degrees offered, >1500 students
  - Chemical Engineering
  - Civil Engineering
  - Electrical & Computer Systems Engineering
  - Mechanical Engineering
  - Mechatronics Engineering
  - Software Engineering
- Several postgraduate degrees, >110 students
  - Masters of Advanced Engineering (Energy & Sustainability)
  - Masters and PhD by research



Monash University Malaysia is a joint venture
Jeffrey Cheah Foundation | MONASH University

4th Industrial Revolution

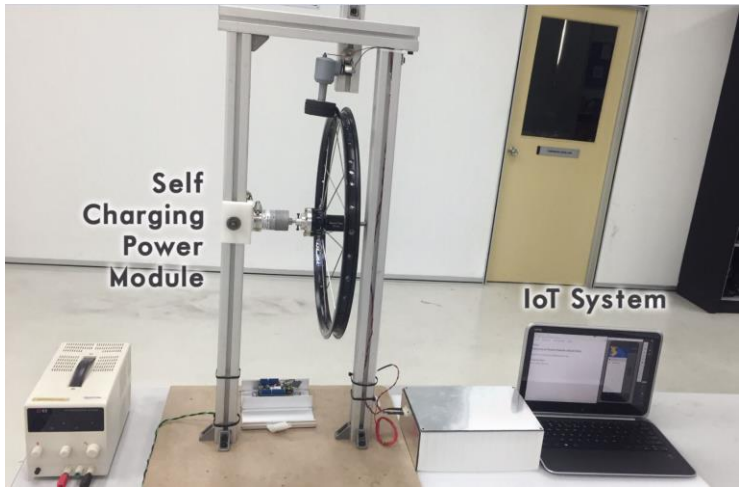


Opportunities …….. and challenges

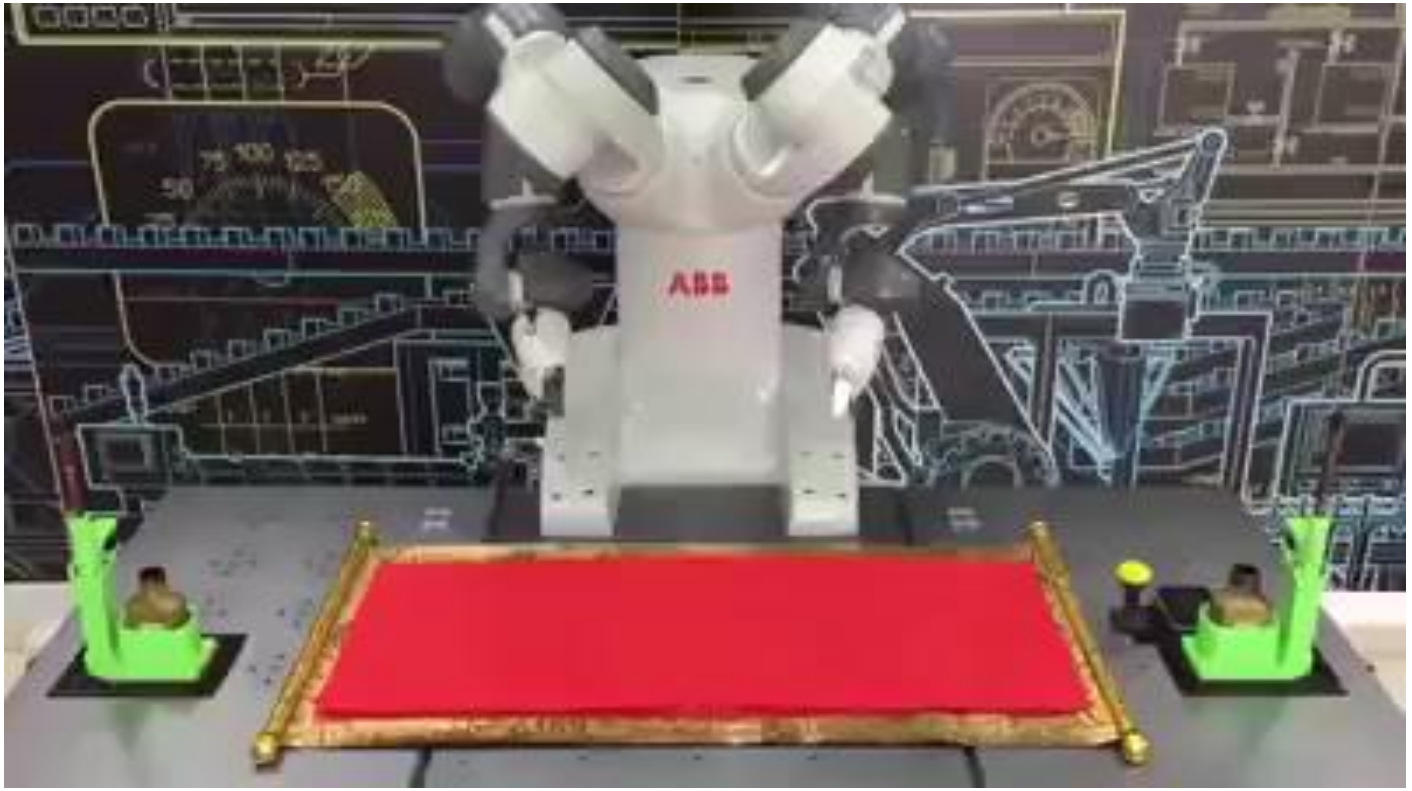
Our work

Students

- Explore 4th Ind. Rev. options
- Win-Win situation for all parties
  - Students
  - Companies
  - Nation

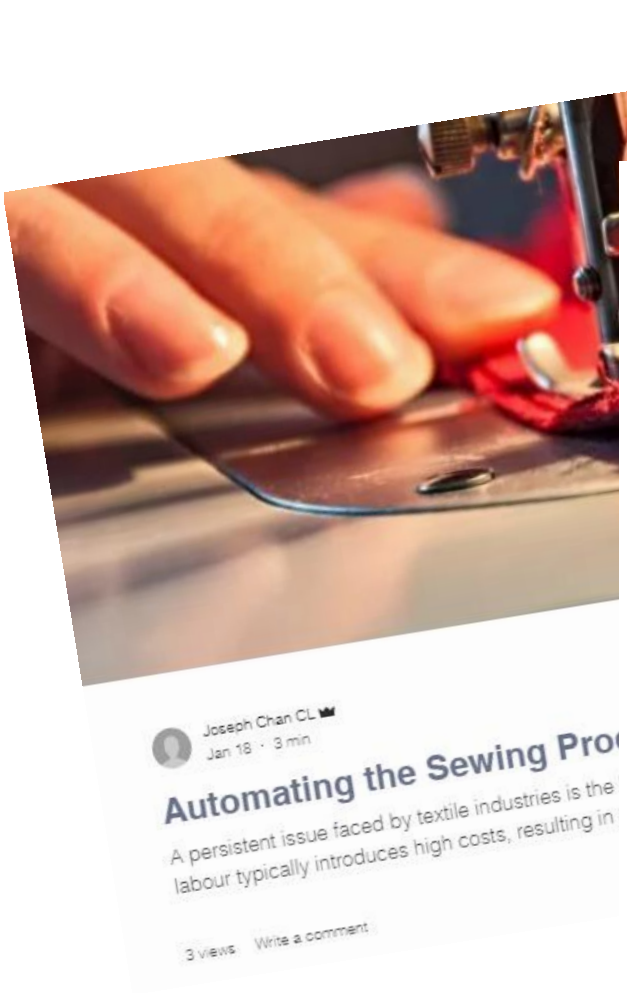


Our work



Our work

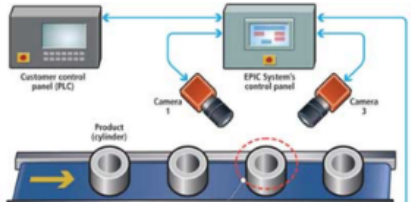
Malaysian Textile and Apparel Manufacturing Industry



Vision-based inspection systems in textile and apparel manufacturing

As global industry progresses, the needs of modern technology become more acute. One such technology is *Vision Systems*. Vision systems or sometimes to be referred as *machine vision system* is a technology that provides image-based inspection for a variety of industrial and manufacturing applications. Vision systems usually consist of a camera (or multiple cameras), and even video recorded and lighting systems. In addition, there needs to be a computer to process the information. The vision systems could either be 2-dimensional (2D) and 3-dimensional (3D), and they are commonly being used in guidance (for robots and drones), automated inspection (for quality control), surveillance (for traffic, nature) and many more other applications.

Figure 1 shows an example of a visual inspection system in the manufacturing industry, together with its components.



Our work

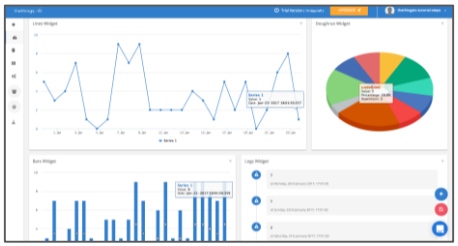
Our work

- Machine ready
- Machine running
- Stop motion
- Production unit completed

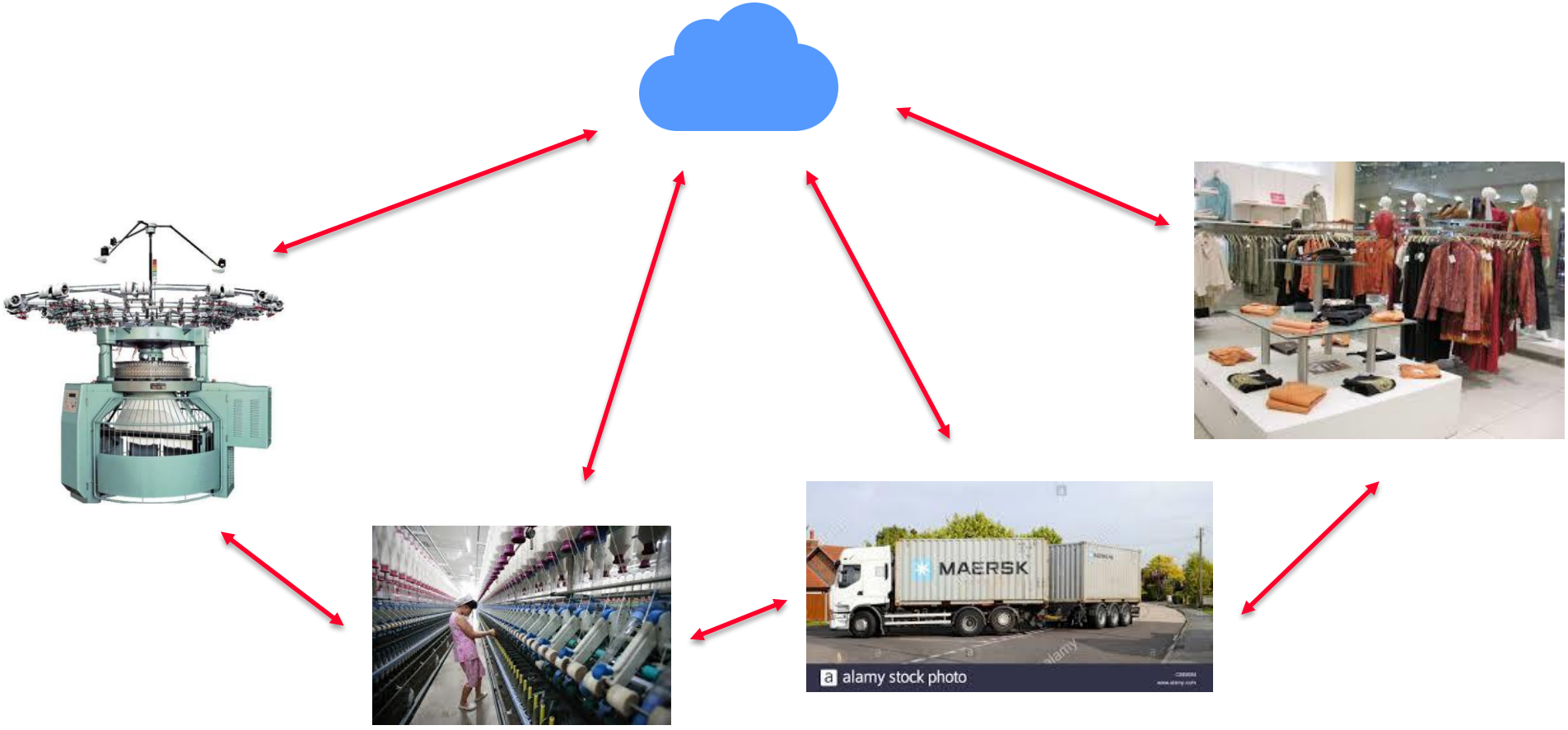
Our work

- Machine ready
- Machine running
- Stop motion
- Production unit completed

- Output
- Efficiency
- Other analytics



Goal – to create a Smart Factory



Presentation at Malaysian Investment Development Authority (MIDA) seminar on Smart Manufacturing 2017

Presentation at ASEAN Federation of Textile Manufacturers Council Meeting 2018

National Research & Development & Commercialization series on Value-Added Automation for Textiles 2018

National Research & Development & Commercialization series on Value-Added Automation for Textiles 2018

Studies on Industry 4.0 for

- Economic Planning Unit (EPU), Prime Minister's Department
  - Assess impact of technology in various industry sectors

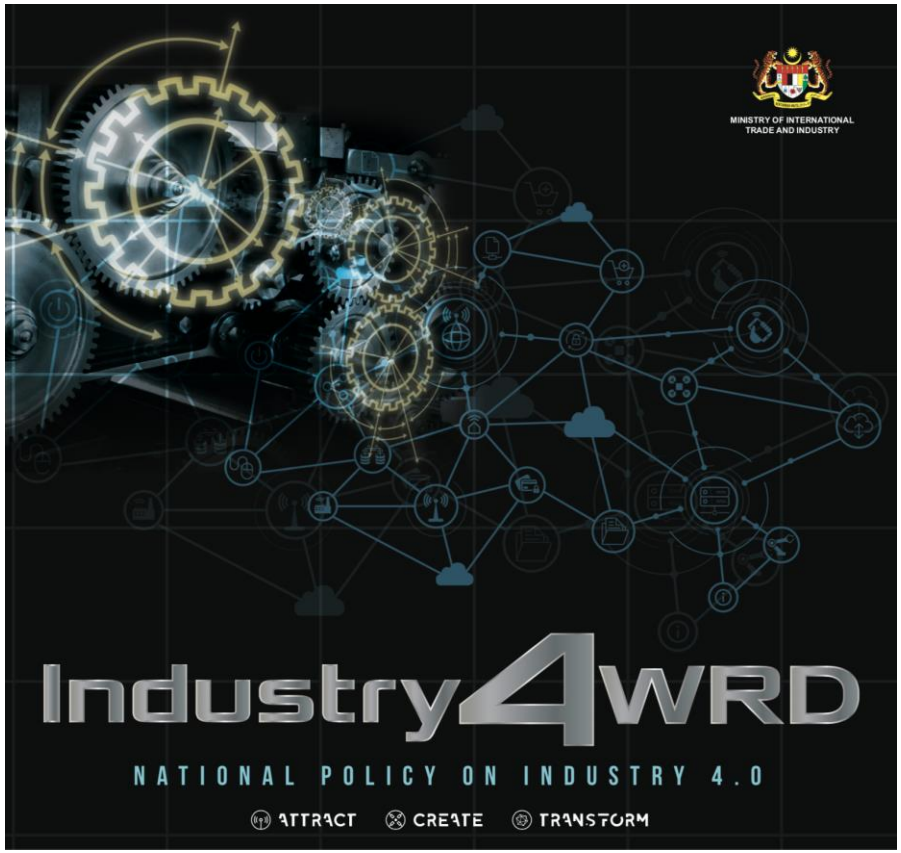
- Selangor State government
  - Identify priority areas for growth

- Malaysian Plastic Manufacturers' Association
  - Identify required talent

- Asia-Pacific Economic Cooperation
  - Policy, regulatory frameworks for Smart Manufacturing

Presentation at APEC Seminar on Understanding Impact of Smart Manufacturing in Policy and Regulatory Approaches, 2018

Contribution to Industry 4WRD: National Policy on Industry 4.0 Shaping The Future Of Industry



Our philosophy on 4th Industrial Revolution

- Expensive equipment not absolutely necessary
- Can bypass Industrial Revolutions 1 – 3
- Does not necessarily mean displacing jobs/workers
- Small, simple, steps

Future work

- Curriculum changes
  - School of IT: Data Science major
  - School of Engineering: New electives in Engineering Cyber-Physical Systems, Internet of Things, Deep Learning

- Infrastructure support
  - Smart Manufacturing Lab
  - IoT Lab
  - Deep Learning Lab

Media exposure

10 | POSTGRAD FOCUS theSun on TUESDAY | DECEMBER 19, 2017

Mechatronics students Lee Loong Yi (seated left) and Samuel Tay (seated right) working on their Final Year projects jointly supervised by ABB. Behind them are Monash supervisors Tan (left) and Khoo Boon How (right).

The crucial role of mechatronics

> Monash University Malaysia's programmes are geared towards preparing students for Industry 4.0

AUTOMATION, artificial intelligence and robotics are a few terms we are increasingly growing fond of these days. From driverless cars to cashless payments, we see the exponential growth of technology that is making our lives better.

Then there is the issue of 3D (dull, dirty and dangerous) jobs, and the lack of local manpower to do these jobs. However, the advent of the technological age has unleashed upon us changes that have significantly improved productivity and quality.

These things are possible due to the synergy created out of the various platforms in the field of engineering. Mechatronics engineering is one such area of study that combines various disciplines to be at the forefront of the Fourth Industrial Revolution (Industry 4.0).

Monash University Malaysia's Bachelor of Mechatronics Engineering (Honours) is a four-year programme geared towards preparing students for Industry 4.0. Students who pursue this degree become versatile and are skilled in multiple disciplines.

"Mechatronics is the synergistic application of various engineering disciplines such as mechanical, electrical, electronics, computing, artificial intelligence and information technology to produce a complete system," said Monash School of Engineering Discipline Head (Mechatronics), Associate Prof Edwin Tan Chee Pin.

"Bright prospects awaits, and we are constantly on the lookout for new technologies to teach our students. The skills mechatronics students learn here in Monash will prepare them for Industry 4.0," shared Monash School of Engineering senior lecturer Dr Veera Ragavan Sampath Kumar.

There are nine pillars which form Industry 4.0, namely autonomous robots, simulation, horizontal and vertical system integration, the industrial internet of things, cyber security, the cloud, additive manufacturing, augmented reality, big data and analytics. Many of these are already part of the curriculum for students of the mechatronics engineering programme.

"In our programme, students use a lot of aids and design tools. All our equipment are also industry certified. For example, the Computer-Aided Design (CAD) tools which we use are also used in the industry, and a lot of analysis tools which we use are available as open-source," Veera said.

Monash's commitment to impart students with skills that are crucial for the working world is illustrated by their continuous efforts to collaborate with companies, with the aim of looking for opportunities that would provide students with real life engineering experience whilst still in their studies.

Third-year mechatronics engineering students are required to carry out a team project called The Capstone Project. This three-month project begins at the second semester of the third year. Students then begin their compulsory three-month internship at the end of their third year and subsequently, their final year project the following year.

Students are encouraged to follow up on their projects through internship and in to the final year. This way students get to finish what they started, seeing a project through to completion.

"What we try to do in the Capstone Project is to work on an industry-related project. Students can then opt to do their internship at the company offering the project, and also continue their internship work as their final year project. This brings good continuity, and a much better sense of accomplishment to all parties, where students could have 'worked' for the company for as long as 15 months by the time they graduate," Tan said.

"We have done framework projects with data acquired from manufacturing processes. These are then stored in relational and non-relational databases. Data analytics is then done to detect faults and schedule maintenance. We have leveraged on many IT technologies, where you can monitor real-time manufacturing processes, set the alarm, and then be able to monitor them remotely," Veera added.

A success story is the collaboration with ABB Malaysia Sdn Bhd where Monash mechatronics engineering students have done their internships followed by their final year project.

"At ABB, our students are closely supervised by trained experts to take learning beyond the classroom and to relate textbook theories in industrial applications; this experience has been invaluable for them," Tan said.

Monash mechatronics engineering graduates can work in a wide range of different fields ... mechanical and electrical engineering, to process ... petrochemical industries ... in the field of IT, the choices are many. Some students have also been hired by data analytic consultants.

"In a multi-disciplinary engineering team, mechatronics engineers are more versatile compared to traditional engineering students because they have a wider outlook and can engage with specialists from every discipline.

"They are able to consider the effects of a decision on all domains. They pick up the best of solutions available to come out with the best systems," Veera said.

For more information on the programmes at Monash University Malaysia's School of Engineering, visit www.eng.monash.edu.my

STORY

...ding the Industry 4.0 wav...

...onics engineering at Monash University Mala...

WHAT UNIVERSITIES NEED TO DO

1. Instil 4Cs into students — Communication, Collaboration, Critical Thinking, Creativity
2. Make programming and ICT education a compulsory subject
3. Develop educational content in collaboration with industry
4. Reform content and the methodology of education via digital
5. Have top people resources to lead global industry engagement

Walker added that Monash is engaged in an ongoing process to review its programmes to provide greater focus on problem-based learning where students are not simply recipients of knowledge. "Instead, they are challenged to create and apply the knowledge learnt to real-world problems."

Taylor's University School of Engineering head Associate Professor Dr Satesh Narayana Namasivayam has a different take on the impact of Industry 4.0 on tertiary institutions.

"I believe over the next 20 years, universities will not exist to provide traditional education for students to obtain their degrees. This role will be taken over by the huge conglomerates that wish to hire people with specific skills and know-how. Thus, students will decide early on what they'd like for a career, personalise their learning through a variety of ...

Harnessing the future through mechatronics

As companies scramble to keep up with Industry 4.0 and its technological developments, educational institutions like Monash University are doing their part to help these companies, including SMEs, stay ahead

By Susanna Lim susannamenenlim@malaysiasme.com.my
Pics by Brandon Eu brandoneu@malaysiasme.com.my

MALAYSIA SME® speaks to Monash University Australia Mechatronics senior lecturer Dr Veera Ragavan, Monash University Australia Mechatronics Program director Professor Sunita Chauhan, and Monash University Malaysia head of Mechatronics Engineering Edwin Tan Chee Pin.

MSME: How would you sum up Industry 4.0 and what is the implication it has on businesses?

Edwin: Industrie 4.0 (IR4.0) was a name first coined in Germany. It was a new area which involved the convergence of various technologies which are now affecting manufacturing and engineering, but also the way we do things in the financial sector and logistics.

Veera: Everything will change in scale with these technologies. The good news is that it is no longer necessary for businesses to be big in order to survive. For small and medium scale industries, IR4.0 is very important for them, because they can provide big outcomes and results by embracing this new technologies that could possibly impact the way in which the business has been conducted. They need to be aware of these changes and slowly step up these skills in order to be ...

There's been more and more uptake for our students in Mechatronics and there are definitely more jobs for them afterwards, especially going into the IR4.0 era.

... nesses which are mainly SMEs. With the association in particular, we're providing a monthly update to a resource portal for what is being done in this industry world-... sities. It's the cheapest way for SMEs to explore these new technologies.

Edwin: An advantage of this is that students are not as exposed yet, so there's no box that limits them. So they come up with new crazy ideas that could be game-changers in any industry.

MSME: Are there industries that will be disrupted more dramatically by IR4.0? And how should they start to implement IR4.0 technologies?

Veera: Industrie 4.0 can impact any industry and anything that isn't even an industry, for instance, lawyers. With any industry, you have physical assets, which are really expensive, they are capital assets and they can be old. But with IR4.0 happening of course everyone wants to sell new equipment. So instead of getting rid of these assets, just adding a cyberlayer to existing physical assets could be one way of enabling a system to progress towards IR4.0. This is where IoT and low cost automation and things like that come into the picture. These are the areas local companies can upgrade their existing machinery and make them IR4.0-ready. One such project is the one with MATEC, where their knitting machinery is

(from left) Veera, Tan and Surita

MONASH University

Media exposure

Staying positive amid uncertainties

APPROXIMATELY 67% of business leaders in the country are optimistic that the business environment will improve over the next 12 months following greater stability in the global economic environment, the Malaysian Business Sentiment Survey 2018/2019 reveals.

However, the increased rhetoric of a trade war between the United States and its leading trading partners remains a concern among business firms in Malaysia and the region.

Despite growing concerns, the spirit of the local business community remains optimistic with 71% confident about their business prospects. This optimism is partly due to increased infrastructure investment along with greater adoption of Industry 4.0 technologies.

The biggest issue that concerns the local market is the increasing cost of doing business, which will have an impact on the bottom line. The weakening Malaysian currency will also severely impact firms that are dependent on imported goods in their production process.

The Malaysian Business Sentiment Survey 2018/2019, conducted by Monash University Malaysia in collaboration with CPA Australia and Global Asia in the 21st Century research platform, gathers the opinions and feelings of the country's business leaders.

"The Malaysian Business Sentiment Survey helps measure the confidence of local business leaders across key macroeconomic areas and provides them with a platform to voice their sentiments and estimations about the business environment in the country," says Prof Mahendhiran Nair, chief executive officer of Monash Malaysia Research and Development and vice-president (R&D) of Monash University Malaysia.

"The primary objective of the survey is to enable decision makers, business leaders and key stakeholders to take proactive measures to improve the local business environment and build a competitive advantage among firms in the country."

Prof Pervaiz (left) and Prof Mahendhiran.

He adds, "One of the key discoveries from the survey is that global markets have become more stabilised and economic growth numbers in many of the economies are on an upward trend. This has had a positive impact on the Malaysian economy.

"However, potential full-blown trade wars between the US and its trading partners may adversely impact the growth trajectories of major economies in the world, business sentiment across the globe and growth potential of firms in Malaysia.

"To mitigate these economic risks, firms are intensifying their market opportunities within the domestic economy and expanding their operations in Asean and other Asia-Pacific markets."

According to Prof Pervaiz K. Ahmed, co-director of Global Asia in the 21st Century and deputy head of school (research) at Monash University Malaysia's School of Business, "CEOs and senior managers are of the view that for firms to be competitive, they will have to embrace the digital economy and Industry 4.0, which will enable them to extend their reach for talent, resources, market intelligence, networks and markets."

The top digital technology identified as important to remain competitive by respondents is mobile technology for customer engagement, which stands at 36%. This is followed by digital payment technology at 34% and socially enabled business processes at 28%.

CEOs and senior managers also highlighted the importance of universities nurturing talent that will enable firms to enhance their innovative capacity, process improvement and product development.

They believe that the top three primary focus areas of universities should be to collaborate with industry (33%), ensure that the R&D initiatives undertaken meet the needs of industry (30%), and develop training programmes that are relevant and beneficial to industry (30%).

"Monash Malaysia continues to work closely with businesses and industries in nurturing creative talent for the innovation-driven economy as we recognise the importance of guiding graduates to improve their employment opportunity," says Prof Mahendhiran.

The Malaysian Business Sentiment Survey 2018/2019 consisted of four phases. Phase 1 was a scoping and content analysis of information from press releases, media reports and commentaries from stakeholders. Phase 2 involved face-to-face in-depth interviews with CEOs and senior managers.

Phase 3 was an online survey involving randomly selected CEOs and senior managers across a wide spectrum of industries, and Phase 4 was validating results with industry captains via roundtable discussions based on patterns in the data.

■ For more information about research at Monash University Malaysia, visit *www.monash.edu.my/research*

Media exposure

Interview on national radio - *The Adoption of Industry 4.0*

https://www.bfm.my/ent-tt-the-adoption-of-industry-4-prof-edwin-tan-chee-monash-university-malaysia

MONASH University
MALAYSIA

THANK YOU

Monash University Malaysia is a joint venture
Jeffrey Cheah Foundation | MONASH University