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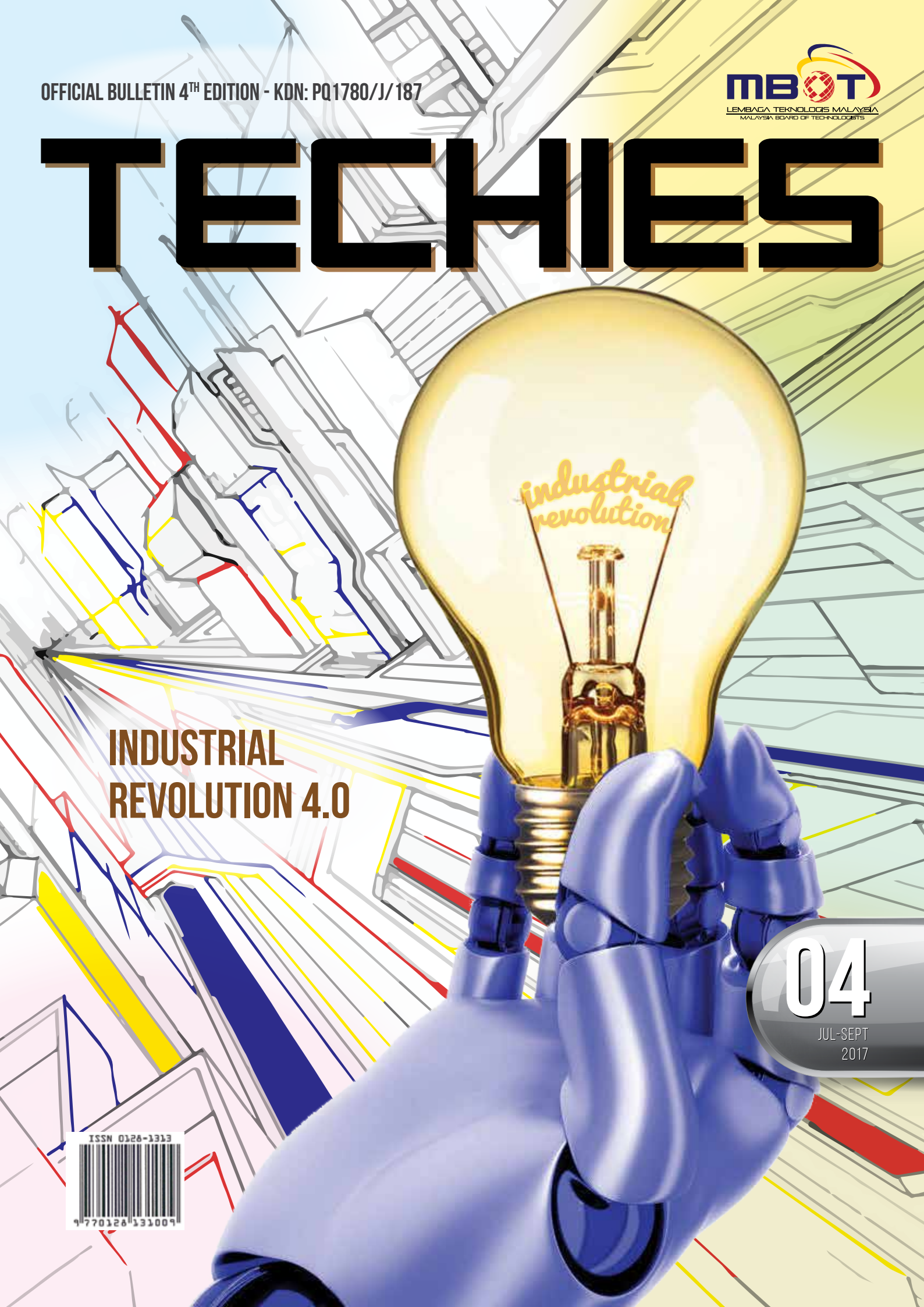
MBOT
LEMBAGA TEKNOLOGIS MALAYSIA
MALAYSIA BOARD OF TECHNOLOGISTS

TECHIES



INDUSTRIAL REVOLUTION 4.0

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Greetings!

How time flies. We are now in our third quarter of the edition. Catching up with the latest trends surrounding Malaysia, we present to you the Fourth Industrial Revolution (I4.0) as our theme in this edition. I4.0 has been the centre of discussions everywhere in the world, fore sighting what technology would be like in the future. It showcases the Internet of Things (IoT), robotics industry, cyber security, driverless cars and many more. It touches upon how our talent pools, mainly our technologists, are impacted.

Here at TECHIES, we constantly look ahead on future issues. We also analyse current situations. We are glad that we have the opportunity to reach the community in the form of this bulletin. This edition gives a general overview of I4.0 and how technologies and technologists are affected.

In an exclusive section, we present a special column by the Honourable Minister of Science, Technology and Innovation (MOSTI), YB Datuk Seri Panglima Wilfred Madius Tangau, who shares his experiences and thoughts attending the 7th Global Science and Innovation Advisory Council Meeting (GSIAC) held in New Delhi. Another highlight is the Mega Science 3.0 that gives the big picture of the future that Malaysia desires, and links it to national imperatives and key economic sectors.

We hope this bulletin will serve as a platform to obtain and deliver perspectives and insights to the community as a whole. We welcome your views, feedback and article contributions.

Happy Reading!

FIND INSIDE

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ADVISORY PANEL
Ministry of Science, Technology and Innovation
Level 7, Block C5, Complex C,
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MBOT would like to thank all those who have contributed in one way or another towards the successful publication of this bulletin.

PRESIDENT'S NOTES

Tan Sri Dato' Academician
(Dr.) Ts. Ahmad Zaidee Laidin FASc

Technologists and technicians are the pillars of strength who will determine the success of the Fourth Industrial Revolution (Industry 4.0). We should aim to be among the top nations in the world with regard to domestic economy, prosperity and innovation.

In Industry 4.0 (I4.0), the value of technology is highly emphasised. Forward-looking principles such as the Internet of Things (IoT), 3D printing, autonomous vehicle, biotechnology and nanotechnology are embedded within I4.0. Emerging technologies have changed the nature of jobs in Malaysia. Sufficient skilled human power to operate rising technologies is the key in the continuous development of a country like ours. There is a host of new types of jobs requiring mastering of new tasks. Nevertheless, it has to be stated that technologies do not replace technologists. Instead, they empower them to do their jobs. Technologists use human skills and characteristics that machines cannot replicate such as intelligence, creativity and experience. This is the kind of mind-set we need to adopt.

Seeing this, MBOT has to move faster so that we can equip our graduates in line with the country's aspirations. If things are not tackled accordingly and quickly, we would not be where we want to be in the future. We need to be well prepared.

MBOT plays an important role to support the government's national STEM agenda. As it is, students taking STEM at secondary level hovers around 27%. However, if TVET is taken into account, the number balloons up to 47%, which is encouraging. Clearly, more good quality STEM graduates are needed to drive the country forward.

Many features must be attended to in order for MBOT to soar high in the wake of Industry 4.0. I look forward to the support and cooperation from all to further develop MBOT and to execute what has been charted. I appreciate the continuous support from everyone to work with MBOT so that it can leave a big impact to the nation as a whole.

ABOUT MBOT

LEMBAGA TEKNOLOGIS MALAYSIA
MALAYSIA BOARD OF TECHNOLOGISTS

- The Parliament of Malaysia has enacted the Technologists and Technicians Act 2015 (Act 768), an act to provide for the establishment of Malaysia Board of Technologists (MBOT), in line with other professional bodies in Malaysia.
- MBOT is responsible for the registration of graduate technologists and qualified technicians as well as to recognise professional technologists and certified technicians.
- MBOT promotes education and professional training in related technology and technical fields.
- MBOT recognises technological careers and empowering technical and vocational education and training (TVET).
- MBOT will strive to be a signatory to international accords in the field of technology and technical to ensure the technologists and technicians produced in the country meet the international standards and ability to compete globally.

01 VISION

To be a world class professional body for technologists and technicians

02 MISSION

To elevate the standing, visibility and recognition of technologists and technicians

03 OBJECTIVES

- To elevate the standing and recognition of technologists and technicians
- To increase the pool of skilled workforce required to attain a high income economy
- To protect public safety and health

WHO SHOULD REGISTER ?

PROFESSIONAL TECHNOLOGIST
Graduate Technologist with practical experience as stipulated by the Board

GRADUATE TECHNOLOGIST
Holds a bachelor's degree recognised by the Board

CERTIFIED TECHNICIAN
Qualified Technician with practical experience as stipulated by the Board

QUALIFIED TECHNICIAN
Holds a certified qualification recognised by the Board

TIME TO LET ROBOTS TAKE CARE OF YOUR FIELDS

By Datuk Seri Panglima Wilfred Madius Tangau

Datuk Seri Panglima Wilfred MadiusTangau speaking at the 7th Global Science and Innovation Advisory Council (GSIAC)

Last April the Malaysian delegation led by Prime Minister Datuk Seri Najib Razak arrived home from a fruitful five-day official visit to India. Thirty-one memoranda of understanding (MoU) totalling US$ 36 billion (RM 159.7 bil) of investments were signed, economic relations between the two countries were strengthened and cooperative efforts in defence were explored.

One agenda of the visit was to attend the 7th Global Science and Innovation Advisory Council Meeting (GSIAC) in New Delhi. Chaired by the Prime Minister, GSIAC was established in 2011 and consists of several Malaysian ministers; the majority of the almost 40 members are captains of industry and renowned academicians from both the country and the globe.

The council, managed by Malaysian Industry-Government Group for High Technology (MIGHT), is an opportunity for the members to deliberate ideas and strategies for Malaysia to advance in science and innovation.
Previous GSIAC meetings have revolved around green futures, smart communities, science, technology, engineering and mathematics (STEM) programmes, and the new economy. Part of the discourse held in London last year was on the role of science centres to promote STEM.

I took the opportunity to visit the UK National STEM Learning Centre located within the University of York campus. Sir John Holman, founding director of the Centre himself, and a couple of senior staff received us and guided our visit. They explained the history of the Centre since 2004, its success that led to extensive branches in the country, its governance and collaboration with the Ministry of Education, Wellcome Trust, Gatsby Foundation and UK commercial behemoths.

I was most impressed with their conviction in STEM talent to prepare UK for the 21st Century knowledge based global economy. We want to emulate their model of supporting educators' and technicians' professional development in STEM subjects, to be an integral part of existing science centres. The first round of consultation between this York Centre and Malaysian officials has been held in the Academy of Sciences Malaysia, with plans to set up a centre locally to follow.

This year was my third time attending the council meeting. The discussion focused on the Digital and Bioeconomy in the age of the Fourth Industrial Revolution. Although it has the potential to raise global income levels and improve the quality of life for populations around the world, I am most concerned about the economic repercussions of the digital economy.

Promoters of these technologies and urbanites would benefit the most. Youths are migrating from their rural communities to cities with attractive digital opportunities, leaving behind a devastating consequence on their agricultural sector.

The developed world had to turn to cheap migrant labour to sustain their plantations. However, adverse social, economic and political effects have led the US and Europe for example, to use automation in farming through robotics, AI and Big Data.

In Malaysia, we need to find ways to incorporate the elements of the Fourth Industrial Revolution in our approach to address challenges faced in the bio-based sector. Traditional manufacturing and service industries, and the rural hinterland would be dangerously left behind if we do not take heed of the possible technological revolution aftermath.

The oil palm and rubber plantations in Malaysia are over-reliant on foreign labour; furthermore productivity is still not at its peak. On the 8th of April it was reported that our palm planters would face severe labour shortage, as field hands from Indonesia who harvest the crops are more attracted to increased employment opportunities at home.

It was also reported that nationwide, we have 5,229,739 hectares of oil palm cultivation, where close to a third of the production stems from Sabah. The lack of labourers in the fields would cause a cascade of problems – fertilisers are not utilised thus reducing yield, a dearth of harvesters that would ultimately cost our economy billions a year. Approximately 38,800 ha of rubber trees are left untapped due to unattractive prices of rubber and also shortages in labour.

LEMBAGA TEKNOLOGIS MALAYSIA
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We would lose out as the number two producer of palm oil and top producer of natural rubber globally if we continue to think that attracting foreign labour is the only means to sustain these plantation industries. Like the developed world, we can explore automation in our farms.

Semi or fully autonomous robotics systems can be built to harvest crops or carry out rubber tapping. Japan's shrinking agricultural sector, caused by an ageing population, accelerated the use of robots in farming lettuce, picking strawberries and tomatoes.

A Japanese lettuce producer is now using industrial robots to carry out almost all the tasks required to grow lettuces, from transplanting of young seedlings to larger spaces, to harvesting them. This innovation is expected to boost lettuce production from 21,000 to 50,000 a day, and within five years, to half a million a day!
In fact, the Malaysian Palm Oil Board (MPOB) is organising the International Competition on Oil Palm Mechanisation. They are offering a grand prize of US$ 1 mil (RM 4.44 mil) in search for mechanisation innovations for field operations in oil palm plantations.

At the Ministry of Science, Technology and Innovation, we are also mobilising our technological capabilities in the digitalisation of plantation, where our agencies and research institutes such as Bioeconomy Corporation, MIMOS, SIRIM and the Malaysian Remote Sensing Agency are called in for a series of roundtable discussion with the industry, Innovators Dynamic, chaired by myself.

One very promising partner in our attempt to automate plantations from the academia is the Centre for Artificial Intelligence and Robotics (CAIRO) of Universiti Teknologi Malaysia (UTM), one of the leading R&D centres for Artificial Intelligence, robotics an automation in the country.

We are leveraging the Japanese's expertise in robotics by collaborating with the Malaysia-Japan International Institute of Technology (MJIIT), also an entity at UTM. Established in 2010, it is affiliated with a consortium of 22 well-known Japanese universities to intensify research and innovation.

Prime Minister closed the GSIAC meeting by noting that we need to give our young ones free rein in their innate imagination and curiosity. Therefore we should pursue quality STEM education for our children through means such as the STEM Learning Centre to prepare them for tomorrow's jobs.

As we attempt to automate our fields, the setting up of MBOT is extremely timely to give the well-deserved recognition to our technologists and technicians. They would be the employers and employees of the jobs of tomorrow.

Prime Minister Datuk Seri Najib Razak chairing the 7th Global Science and Innovation Advisory Council (GSIAC) meeting in New Delhi.

FUTURE OF MALAYSIA TECHNICAL UNIVERSITY NETWORK (MTUN) IN THE LIGHT OF THE 4TH INDUSTRIAL REVOLUTION

By Shahrin Sahib, Fazidah Ithnin and Khairul Razik Mohd Isa

"We must develop a comprehensive and globally shared view of how technology is affecting our lives and reshaping our economic, social, cultural, and human environments. There has never been a time of greater promise, or greater peril."
Professor Klaus Schwab, Founder and Executive Chairman, World Economic Forum

Intensifying the Prominence of MTUN IN THE 4IR ERA

The Fourth Industrial Revolution (4IR) is a term designating cyber - physical systems, which introduces radical changes in production processes compared to the current situation (Pecina & Sládek, 2017). It urges us to think creatively about manufacturing, distribution and customer service processes. At the same time, the future of education emphasises the immense need to look beyond these areas and to strategically utilise the "Internet of Things" to prepare the coming workforce for the challenges ahead (Abu Mezied, 2016).

"Shape a future that works for all by putting people first, empowering them and constantly reminding ourselves that all of these new technologies are first and foremost tools made by the people for the people."
Professor Klaus Schwab, Founder and Executive Chairman, World Economic Forum

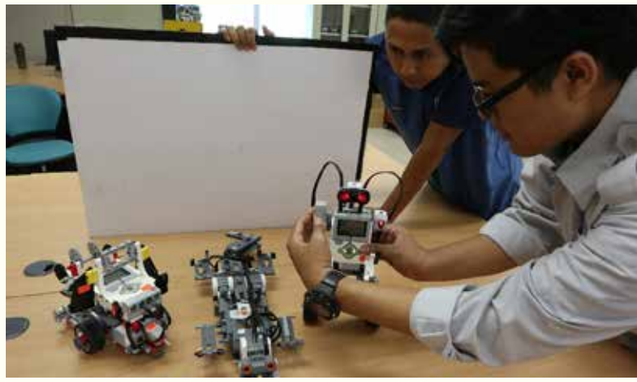
Established with the mandate to produce highly-skilled technical graduates to fulfil the nation's aspiration of a highly industrialised country by 2020, universities that belong to the Malaysia Technical University Network (MTUN) serve as technical and vocational education and training (TVET) institutions. Efforts to strengthen TVET continue under the the 11th Malaysia Plan (2016-2020) emphasise the concept of "anchoring growth on people". The government has outlined six strategic thrusts that will help Malaysia stay ahead of the challenges and opportunities of today's fast-changing global and political landscapes. The Prime Minister asserts that the government will continue to improve the quality of students and placing TVET in the mainstream. Thus, MTUN, a network of four technical universities (Universiti Teknikal Malaysia Melaka (UTeM), Universiti Malaysia Perlis (UniMAP), Universiti Malaysia Pahang (UMP) and Universiti Tun Hussein Onn (UTHM)) have been commissioned to produce a highly-skilled workforce – the future captains of industries who are equipped with the latest technological know-how and imbued with sound entrepreneurial attributes, thus empowering them to be fully functional world citizens.

In line with the rapid evolution of technologies in the 4IR, the Malaysian higher education system needs to be re-aligned for global recognition and relevance. Understandably, the market is a powerful determining force in making university education relevant to employment. Recent developments in the labour market sector have resulted in a rapidly changing pattern of manpower needs and human resource allocation and utilisation (Azman et al., 2010). MTUN acknowledges the expeditious advancement of technology in the forthcoming years, specifically that which is related to mobile apps and virtual learning. At the precipice of the 4IR, advances in technology and the rise of the Internet of Things have transformed industries across all sectors — from smart cities to artificial intelligence, with every industry becoming more dynamic and personalised (Abbassi, 2017). While this new era in the global economy ensures rapid change and innovation, one thing will be constant: connectivity. This feature will be an essential requirement for participation, with mobility as the key platform to deliver and expand in terms of dissemination of knowledge, thus encouraging an open cloud of shared information. The fact is that, new technology begets newer and ever more capable technology. It is not only changing the "what" and the "how" of doing things but it also changes "who" we are (Schwab, 2016).

As such, the main challenge for MTUN universities now is to lay a strategy that allows them to be competitive in an increasingly changing global higher education environment. Shifting towards the new decade of the rise of machines, UTeM, as one of MTUN's institutions, has developed consolidated strategies to ensure its relevance globally by adopting the framework of a future-complying Apps University (Ithnin, et al., 2017). A discourse on alternative future scenarios held in 2012 gave rise to the establishment of the Centre for Instructional Resources and Technology (CIRT), which has been tasked to respond to the current highly imperative technology surge. CIRT oversees and reinforces the functions of the University's Official Learning Management System (uLearn), a gateway to UTeM open educational resources (OERs), and UTeM Massive Open Online Courses (MOOCS).

Arguably, shifting from the factory model to the more prevailing 'university in a gadget' model entails a widely accessible higher education provider. With the support of a pervasive mobile internet, education has now become infinite. UTeM has successfully paved ways for this technology through an 'open learning culture' domain with the inclusion of MOOCs and personalised learning environment, where academicians assume greater student-centric roles that are flexible and conducive.

MTUN universities will and must continue to be adaptive and responsive in the heat of the 4IR. The education 4.0 scenario, which will undeniably dissipate all skill-based and repetitive skills, calls for a digital revolution that proliferates into a transformation that will unequivocally change the way we live, work, and relate to one another. Subsequently, university-industry network too will require a new story and a new culture. The rise of a global knowledge economy has intensified the need for strategic partnerships that go beyond the traditional funding of discrete research projects (Valigra et.al 2012). Synergies will have to be intensified through structured and sustainable programmes that will ameliorate



Projecting forward into time, MTUN universities continue to entrench networking with industry partners through structured programmes such as the CEO@faculty programme that sees the appointment of CEOs from top notch industries. These CEOs function as university-industry expert advisors, sharing best practices and first-hand knowledge and adding value to students' learning experience. To add, in UTeM, the establishment of the Samsung Internet of Things (IoT) Centre, and the Malaysia Centre for e-Learning (MyCeL), assists in the development of "digital thinking" among students. This enables them to manage processes in new, exciting ways.

Conclusively, higher education in the 4IR is a complex, dialectical and exciting opportunity which can potentially transform society for the better. Powered by artificial intelligence, 4IR will indefinitely transform the workplace from task-based to human-centred charges. Subsequently, the convergence of human and machine will reduce the subject distance between humanities and social sciences, as well as science and technology. This will necessarily require much more interdisciplinary teaching, research and innovation. Therefore, MTUN universities must assume the role of the master key in escalating the quality of higher education in Malaysia, especially in the TVET sphere. This will undoubtedly bring about significant impact to the society, the nation and the world.

CATALYSING KEY ECONOMIC SECTORS THROUGH SCIENCE, TECHNOLOGY AND INNOVATION (STI)

By Academy of Sciences Malaysia

The advent of the Fourth Industrial Revolution (4th IR) is a tipping point in science, technology and innovation that is unveiling unprecedented advances. It is expected to phenomenally change the way we live, work, and relate to one another. As such, there is a need to anticipate future trends and demands and make strategic STI interventions and investments today to thrive in the future. This is the premise of the Academy of Sciences Malaysia's (ASM) Mega Science study.

Academician Tan Sri Datuk Dr Ahmad Tajuddin Ali FASc (Immediate Past President, Academy of Sciences Malaysia) presenting a draft copy of Mega Science 3.0 study to YB Datuk Seri Panglima Wilfred Madius Tangau (Minister of Science, Technology and Innovation).

In 2010, ASM embarked on the Mega Science study with the aim developing a strategic roadmap towards 2050, in key sectors, based on science, technology and innovation (STI) to ensure Malaysia's future competitiveness. The Mega Science study forms an integral part of ASM's "Envisioning Malaysia in 2050" flagship initiative. To date the Mega Science study having completed its third phase has covered fifteen sectors as illustrated in Figure 1.

MS 1.0 (2010): 5 SECTORS (WEHAB)

Water · Energy · Health · Agriculture · Biodiversity

MS 2.0 (2013): 5 SECTORS (HITEE)

Housing · InfrastructureT · ransportation · Enviroment · Electricals & Electronics

MS 3.0 (2015): 5 SECTORS (FACT/PC)

Funiture · Automotive · CreativeT · ourismP · lastics & Composites

The Mega Science 3.0 study carried out from 2015 until 2016 looked at five industries namely Furniture, Automotive, Creative, Tourism, and Plastics and Composites. These industries were selected on the basis of their combined contribution to national GDP in 2014, which was valued at RM 148 billion and is projected to increase towards 2050.

The strategies, recommendations and roadmaps for the short, medium and long-term (2015-2050) for these five industry sectors were presented at the Mega Science 3.0 National Forum and Exhibition held in November 2016.

Malaysia has always been known for its wood-based furniture, owing to its abundant and high quality wood resources. For Malaysia to be a world leader in the furniture industry, there is a need to develop design capabilities to leverage on the disruptive 3D printing technology that is rapidly advancing. This would enable the Malaysian furniture industry to evolve from original equipment manufacturer (OEM) to original design manufacturer (ODM) and ultimately to original brand manufacturer (OBM), commanding higher market share and returns. Work in the Malaysian furniture industry is often seen being difficult, dirty and dangerous. As such, automation is a key area that must be realised to reduce dependence on foreign labour and attract high skilled, young, local talent.

R&D on alternative materials through tissue culture for new breed of trees could find a solution to the inconsistent supply of planted wood and certified sustainable timber. By 2050, we would have moved beyond the "Internet of Things" to the "Internet of Everything", where smart and connected furniture personalised to our lifestyles could become Malaysia's furniture identity.

RATIONALE

Addressing basic necessities

Tackling Peopleẽ well-being

Catalysing key economic sectors through STI for wealth creation

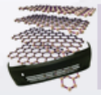
HOW STI PLAYS A ROLE

Academician Emerita Prof Datuk Dr Mazlan Othman FASc, Project Director of Mega Science 3.0 (second from left) showing the Minister a roadmap of technologies heading into 2050 that were studied.

As for the automotive industry, it contributes 2.5 per cent to the national GDP annually and 5.84 per cent in terms of employment. There is tremendous growth potential for this industry but we must be aligned to global trends and future demand. The key disruptive technology trends in the automotive sector according to McKinsey are diverse mobility, autonomous driving, electrification and connectivity.

Heading towards 2050, the industry is pushing for vehicles with greater fuel efficiency and lower carbon emissions starting with the Hybrid Electric Vehicle taking off globally by 2020, Plug-in Hybrid Electric Vehicle by 2025 and Battery Electric as well as Fuel Cell Vehicle by 2030. By then also, the industry is expected to be fully migrated to autonomous vehicles powered by fuel cell batteries leading to zero emission. A snapshot of critical R&D areas in the automotive sector is shown in Figure 2.

Integrated Digital Engineering
Vehicle energy management system
Smart manufacturing
Power trains
Advanced transmission system



Advanced Green Materials
Smart material
Advanced Plastic Composite
Advanced Metal Composite

Big Data Movement
IoT vehicle technology
Vehicle Communication System
Vehicle data security system
Navigation

Advanced Integrated Active Safety
Intelligent System
Embedded System
Vehicle advanced passive and active safety system

The creative industry is often overlooked as a strategic industry where STI can value add and make a phenomenal difference. As identified by the United Nations Conference on Trade and Development (UNCTAD), the creative industry is underpinned by four major sectors: Media, Heritage, the Arts and Functional Creations.

The global cultural and creative industries revenue is estimated to be USD 2.25 trillion in 2015 and this makes up 3% of the world's GDP. This sector also provided 29.5 million jobs globally in 2015.

In Malaysia, the total Gross Value Added (GVA) for the creative industry rose from RM20 billion (2.5%) in 2013 to RM 28 billion (2.7%) in 2015 and is projected to increase to 4.1% in 2030. In 2010, the four areas of the industry employed 146,250 people in 10,559 establishments.

The creative industry and national identity must be given due attention and the Creative Industry National Policy should be followed through with well-governed implementation. The creation of a one-stop-centre for tracking and licensing technology development would boost the industry. Full adoption of relevant technologies should be considered in order to enhance the sector in terms of ideation, funding, production, marketing and distribution to realise innovations.

The total contribution of Travel & Tourism to Malaysia's GDP was RM 152.8 billion in 2015 and is forecasted to rise 5.1 per cent per annum to RM 267.7 billion by 2026. Travel experience has been revolutionised by digital technologies, such as our mobile phones, wearables, robots and real-time information. As such, STI will be a major enabler to value add to the industry and raise revenue.

With virtual reality (VR) and augmented reality (AR) advancing rapidly, the application of such technologies through user-friendly modes would profoundly redefine the tourism industry. This would give rise to phenomenon such as "brain holidays" in the future. As such, this industry cannot be developed through conventional lenses but STI should be leveraged to transform the tourism industry to meet future demand.

Malaysia's plastics and composites industry is another major contributor to the national GDP, and will continue to grow due to huge demand from other industries, such as housing, transport, clothing, and telecommunications. Alignment to the World Economic Forum's "New Plastics

Circular Economy", including Waste to Wealth/Worth (W2W) and Reduce, Reuse, Recycle, Recover (4R's) elements would augur well to chart the development of this industry.

The national outlook for the plastics and composites industry is RM 190 billion in revenue and RM 100 billion in export by 2050. Four key focus areas to be developed for this sector as identified in the Mega Science study are advanced materials, advanced manufacturing, product development as well as environmental and sustainable development. This industry is well poised to be a catalyst for the development of smart materials for a sustainable future.

For any industry sector to take off, talent is one of the critical factors. When it comes to implementing ideas and creating value to realise innovation, the key factor is people at the heart of global networks. People are the prime movers of innovation. As such, talent development is crucial for these sectors.

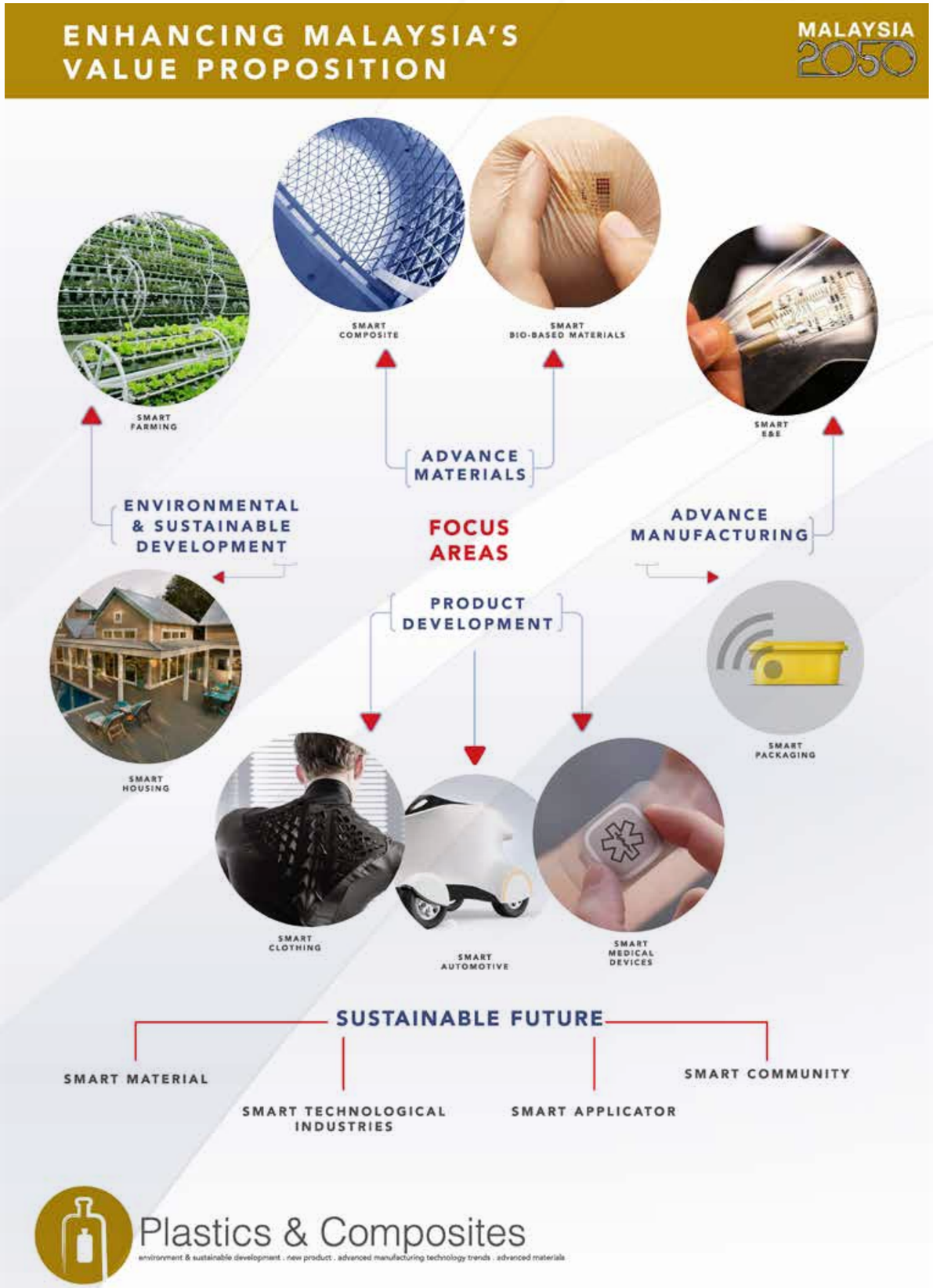
A national study, S&T Human Capital: A Strategic Planning Towards 2020 (2012) mentioned that Malaysia needs at least 1.0 million S&T human capital by 2020 based on a 6% annual economic growth and the emergence of EPPs (Entry Point Projects) under the NKEAs as well as the emergence of new technology-driven sectors such as nanotech. Out of the 1 million S&T workforce required by 2020, 500,000 need to be high skilled workers arising from technical, vocational education and training (TVET).

However, TVET is seen as a less attractive pathway than university education, thereby limiting the number of students, particularly high-performing ones, who apply for such courses. Malaysia needs to move from a higher education system with a primary focus on university education as the sole pathway to success, to one where academic and TVET pathways are equally valued. This would be crucial to produce high skilled and competent technologists for the nation's key sectors.

The line between man and machine is getting blurred in in the fourth industrial revolution. According to the World Bank Group, two thirds of all jobs could be susceptible to automation in developing countries in the coming decade. Another estimate by Forbes stated that 47% of US jobs are at risk from automation. The requirements of jobs are shifting into expert knowledge versus catering for physically demanding roles. Machines are expected to fully take over the cumbersome, dangerous and routine tasks as they would be able to deliver greater productivity and efficiency. The roles of people, would also have to change in tandem to the new operating landscape. Their responsibilities will increasingly shift to knowledge work, process control and decision making. It is important to not only develop such talent for the future but also invest in the reskilling and upscaling of new entrants in the current workforce to carry out such functions in the future.

In order for Malaysia to remain competitive, industries must become proficient in leveraging STI and the requisite talent must be nurtured. This calls for shaping of a new mindset and sharpening of skillsets.

Minister of Science, Technology and Innovation viewing some of the displayed technologies at the Mega Science 3.0 National Forum & Exhibition.



ENHANCING MALAYSIA'S VALUE PROPOSITION

MALAYSIA 2050

ISSUES AND CHALLENGES

Transportation Infrastructure
- Charging stations and facilities
- Road design and traffic management
- Parking lots will decrease significantly
- Wireless Advanced Vehicle Electrification
- Internet of Things (IOT) and sensors for monitoring traffic

Potential Geopolitics & Economic
- Emergence of other countries for Original Equipment Manufacturer (OEMs) (China and India) & in design, development and advancement (Europe, Japan, Korea and US)
- Autonomous Vehicle (Avs) will free up time for drivers, increase road safety, and reduce vehicle operation costs

Culture & Social
- AVs will reduce necessity for drivers' licence
- Jobs are created as new technology, telecommunications, information technology and creative industries merges

Market Entrance
- Subjected to speculations and constraints
- Consumer attitudes, habits, legislation, infrastructure and convenience issues
- Fear of reduction in oil demand
- Global energy sector most influential community in determining market penetration

Training & Educational Requirement
- Need trained technical workforce in critical areas
- Understanding of new safety requirements for alternative energy sources and hybridisation
- Curriculum to include car connectivity and disrupting technologies penetration

Disruptive Technologies
- Mobile Internet
- Automated of Knowledge Work
- The Internet of Things
- Cloud Technology
- Advanced Robotics
- Autonomous Vehicle
- Energy Storage
- 3D and 4D printing
- Advanced Materials
- Renewable Energy

STRATEGIES

01 **Formulate appropriate government policy, regulations and incentives in the following aspects:**
- Environment • Businesses and trades • Talent • Standardisation
- Incentive options to help promote e-mobility

02 Develop business collaborations within the e-mobility value chain

03 Identify customers' attitude towards new vehicle usage and benefits thereby reducing anxieties and increase acceptability

04 Institute relevant support infrastructure coordination

05 Create a strong R&D community to explore the development of e-mobility

RECOMMENDATIONS

Continue to enhance the automotive ecosystem

Formulate new policy instruments for e-mobility

Spearhead future e-mobility businesses

Improve technology development and R&D

Create e-mobility R&D community, associations and young talent programmes

Adjust for cultural simulation towards e-mobility

Automotive
advanced integrated active safety . advanced materials . big data movement . integrated digital engineering

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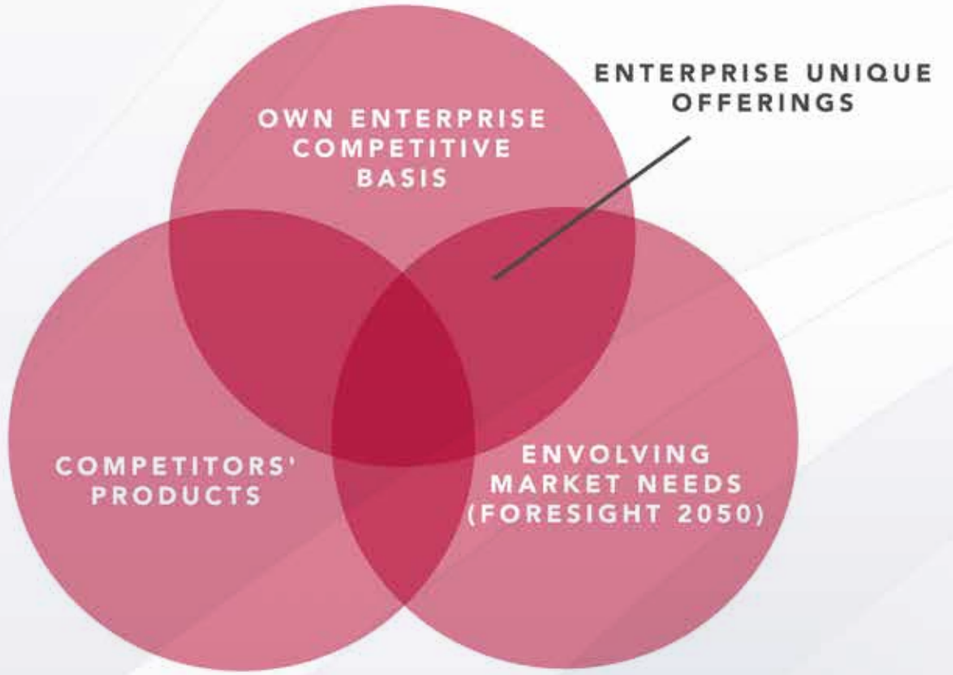
ENHANCING MALAYSIA'S VALUE PROPOSITION

MALAYSIA 2050



NATIONAL ISSUES / CHALLENGES

- Non-optimisation of national strengths
- Governance overlaps
- Non-optimisation of adoption of Dasar Industri Kreatif Negara (DIKN)
- Protection of Intellectual Property to be intensified
- Data is limited
- Need to capture a larger share of the global market
- Lack of awareness of disruptive technologies. Strategic responses required
- Training institutes not optimized
- Talent drain is a threat
- Skills to utilize new technologies limited

Creative
functional creations . heritage . media . the arts

Tourism

ENHANCING MALAYSIA'S VALUE PROPOSITIONS

MALAYSIA 2050

Technology In Tourism

- Digital Interaction
- Mobile
- Realtime Insights
- Wearables
- Robots
- Real time customization

Strategies

Governance

- Strengthen enforcement of laws, rules and regulations
- Monitoring, tracking & evaluating impact of tourism activities
- Coordination of products and services at all levels

Outreach and Advocacy

- Remedial actions against pollution and existing environmental challenges
- Adopt international best practices to promote and develop sustainable tourism
- Involvement of local communities in tourism developement to eradicate poverty

S&T Implications and R&D Needs

- ICT usage expansion to enhance tourist experience
- Technological revolution and impact on future tourism

Capacity building

- Good governance, management, leadership and funding increases standards and productivity

Recommendations

- Use technology to enhance tourist experience
- Strengthen city tourism
- Address talent deficit
- Implementation of Disability Act 2008 in all sectors
- Embed sustainabilty appreciation in education & society
- Encourage community Participation in Traditional arts & culture
- Promote green technology developement in tourism
- Effective use of HRDF for talent development
- Circuit TV and tracking device to increase safety in ecotourism areas
- Strengthen environmental protection
- Enforcement of laws
- Sectoral resource management for renewable energy
- Revamp community tourism model to give higher yields to rural communities
- Strengthen governance mechanism at national, state and local levels

Furniture

ENHANCING MALAYSIA'S VALUE PROPOSITION

MALAYSIA 2050

Strengthen university-industry-government link.

- Enhance programmes for designers

R&D on innovative furniture

- IoT of furniture
- Adopt advanced technologies (CAD/CAE/CAM, Rapid Prototyping)
- Functional design

Diversify raw materials

- New wood species, bio-plastics, bio-composites, natural fibre, or wood plastic composite (WPC) as substitute materials

DESIGN

Synergy for business growth

- Review of national policies (foreign labour and downstream industries)
- Strengthen institutional support and delivery system

Original Equipment Manufacturer (OEM) to Original Design Manufacturer (ODM) to Original Brand Manufacturer (OBM)

- Develop new business model
- New ODM companies linked to recognised brand companies
- New marketing platform (Virtual Reality)

MARKETING

STRATEGIES & RECOMMENDATION

SUSTAINABILITY

Certification through Chain of Custody (CoC)

- Review national policies on high value added industries, rubber and timber wood sustainability

Create awareness on sustainability

- Introduce new wood species
- Consistent supply of planted wood
- Certified sustainable timber
- Sustainability of resources

R&D on alternative materials, sustainable raw material and new species

- Tissue culture for new breed trees (shorter maturing age, high quality)
- Furniture Testing Centre for certified quality furniture

MANUFACTURING

Agile Manufacturing

- Cost-saving manufacturing technologies

Higher education in furniture design and manufacturing

- Train youth with skill sets for all levels
- Reduce dependence on foreign labour

Awareness on sustainability

R&D on alternative materials, advanced manufacturing technology

- R&D on cutting tools, processing machineries and technology
- Adopt /develop advanced technologies (Computer Numerical Control Machine, 3D printing)

4.0 INDUSTRY REVOLUTION IN THE FOOD SECTOR

By Dr. Pasupuleti Visweswara Rao

The first industrial revolution was mainly about mechanization and the utilization of water and steam power, while the second industrial revolution focused more on mass production and the use of electricity. The rise of computer and automation made up the third industrial revolution, while the current upheaval we are in today, more popularly known as Industry 4.0, deals with cyber-physical systems. . Artificial intelligence, biotechnology, IoT (Internet of Things), nanotechnology, digital technologies, and 3D printing, among others, enable the realisation of the 'smart factory' that deals with smart systems and cutting edge technologies.

In the same manner, the food industry has also gone through substantial transformative stages over the years. The first food revolution was only about simple farming, while the second focused on manufacturing and mechanisation, followed by the third, which was mainly on technology-based products, advances in processing machineries and attention towards genetically modified foods. In the 4.0 revolution, all the above mentioned factors are collectively put to work to attain sustainability , safety , cost effectiveness, and affordability in food production. To add, nanotechnology is applied to aid in faster food production and processes.

In the world today, there are snowballing burdens on agricultural manufacturing, where lack of human labour resources is rampant. . This results in a greater need for innovation in food manufacturing, either from the use of totally new technologies or by spreading present available technologies from different segments of application. New technologies that come with Industry 4.0 enable consumers to scan the QR code of particular products, which would then direct them to webpages that give clear information on the products such as the content of the food and its supply chain.

Digitalisation influences many sectors including the food industry. In the current scenario, advanced technologies strengthen food safety aspects, which in turn fortifies the role of food in human health, especially with sedentary lifestyle becoming very common nowadays. Demand and needs influence food production and, by extension, food economy. Industry 4.0 has the capacity to ensure that food and agricultural resources are sufficient and sustainable, and that food is safely manufactured, healthy and affordable. With much development, in line with the industrial revolution, processes and bulk production of foods and their information are available. Through IoT, the combination of food manufacturers and suppliers working together decreases maintenance costs, influences productivity, uncovers opportunities, and enhances supply chain. The industry can use IoT to attain quality standards, with the same product having the same superior quality anywhere and anytime.

Food Economy 4.0 is the combination of physical food production and the digitalisation of all related processes. This contributes towards achieving sustainability of the ecosystem as well as realising innovative and creative entrepreneurial prototypes. In digitalisation, artificial intelligence (AI) helps in reducing food waste as well as the number of operators needed on the shop floor. AI also helps in effective data analysis, modelling, processing, colour classification of foods and quality control. It brings about accurate and cost effective process projections, which result in maximising food quality and productivity. Alongside technology, geographical conditions play an important role in food production and sustainability. People living in certain geographical regions may not have the opportunity to take part in the 4.0 revolution. Modern technology with affordable cost and the availability of all related support systems would be helpful in achieving the goal of the fourth industrial revolution for the betterment of both rural and urban expanses. The best development in a nation is when villages acquire progress and growth appropriately. Development in villages directly and indirectly reflects the country's direction and economic status. The fourth industrial revolution, if suitably taken advantage of, would undoubtedly benefit everybody including entrepreneurs, industrialists, as well as farmers in one way or the other

AUTHOBIOGRAPHY

The author is the Deputy Director of Institute of Food Security and Sustainable Agriculture (IFSSA) Universiti Malaysia Kelantan. For more information of the author please visit *https://publons.com/author/528057/visweswara-rao#profile*

FOCUS GROUP DIALOGUE: Towards Readiness of 4th Industry Revolution

By Dr. Naimah Md Khalil

BALIK PULAU, 9 August 2017 - A Focus Group Dialogue (FGD) was held at Politeknik Balik Pulau. The dialogue, co-hosted by The Department of Polytechnic Education (DPE) and Politeknik Balik Pulau (PBU) was well attended by 45 participants from 30 industries as well as the lecturers and students from polytechnics and community colleges. The event was officiated by Mr Tung Chee Kuan, the Director of Industry Liaison & Employability Division who represented the Director General of the Department of Polytechnic Education.

The intention of the dialogue is to serve as a platform for deliberation in achieving a better understanding of the government directions, industry expectations and institutions capacity in meeting the challenges of the Fourth Industrial Revolution. Four speakers from industry, Mrs. Siti Norliza Mohd Sahar, Director of Talent & Digital Entrepreneurship, MDEC, Dr. Dzaharuddin Mansor, National Technology Officer, Microsoft Malaysia, Mr. Amiruddin Zahamail SITRAIN Manager SIEMENS Malaysia and Mr. Prakash Poobalan, Senior Manager Industry Technical Collaboration, Penang Skills Development Centre (PSDC) shared their knowledge and ideas during the session. The forum was mediated by Mrs Noor Aidi bt Nadzri, the Director of Curriculum Development Division and Dr Zainal Azhar bin Zainal Abidin as the co-mediator.

Panelists were discussing. From left: Mrs Noor Aidi, Mrs Siti Norliza Mohd Sahar, Mr. Prakash Poobalan, Mr. Amiruddin Zahamail, and Dr. Dzaharuddin Mansor

Mr Tung Chee Kuan officiating the Focus Group Dialogue (FGD). From left: Mr Tung and Tn. Hj. Mohd Fisal bin haroon, the Director Of Balik Pulau Polytechnic.

Mr Tung Chee Kuan, in the opening speech stated that this platform was established to bring together the wealth of experience and expertise in the industry with TVET players in an intellectual discourse for the purpose of developing quality and competent human capital for the 4th Industrial Revolution. Polytechnics as the leading TVET provider, with a current annual enrolment of over 100,000 and half a million graduates must respond to the needs and requirements of the Fourth Industrial Revolution and therefore the input from the dialogue is important towards this end.

Participants raising questions during the session.

The four speakers spoke on the need to change the current mind-set and the urgency to embrace the change as there is no escape from this revolution. The 4th Industrial Revolution brings about changes and the developments which will disrupt our social and work life due to the rapid advancement in knowledge and technologies for example the Internet of Things (IoT). New jobs have to be created while existing ones phased out. Hence, the future is not about unemployment but redeployment. Thus upskilling and reskilling are necessary to ensure skills are relevant to the industry and the workforce in general. It is hoped that such dialogues could provide the platform for TVET providers and industries to come together to have a deeper understanding of the future workforce and therefore reduce skill mismatch. Polytechnics need to work closely with industries to ensure readiness in meeting the advent of the Fourth Industrial Revolution.

HOW DO UNIVERSITIES WELCOME INDUSTRY 4.0?

By Assoc. Prof. Marlia Puteh

The demur against the 4th Industrial Revolution or Industry 4.0 is intensely confronting Malaysia and the Ministry of Higher Education is pragmatically among the most important ministries to address the challenges brought about by the technological shift. I am compelled to write on how the public institutions of higher learning can withstand the challenges albeit the status quo and the global development facing Malaysian universities.

Everyday jobs could be automated in the future and Industry 4.0 has brought about technology advances that may change the scenario. Industry 4.0 leverages on disruptive technologies which touch upon many fields – Internet of Things (IoT), cyber security, big data, cloud, mobile internet, advanced robotics, next-generation genomics, energy storage, 3D printing, advanced materials, advanced oil and gas exploration and recovery and renewable energy..

Is Malaysian Higher Education ready to embrace Industry 4.0?

Here comes the big QUESTION. Is Malaysian Higher Education ready to embrace Industry 4.0? In April 2015, the Ministry launched the Malaysia Education Blueprint 2015-2025 (Higher Education) which aims to guide Malaysia's higher education sector over the next 11 years. 10 shifts were identified to meet future higher education challenges and demands. Central to our higher education aspirations is our aim to produce holistic graduates with an entrepreneurial mindset and balanced outlook, ready to sacrifice their time and put in effort for the sake of harmony and the well-being of their family as well as local and international communities. Following this, in 2016 we looked at how to make education more flexible and in 2017, we embark into an ambitious adventure to redesign our higher education.

The Blueprint has outlined the graduates' attributes to be nurtured in parallel with individual ethics and values through one's reflection of the nation's history and conducts. It is the Ministry's task to prepare Malaysian graduates towards heutagogy and individuation – managing self-determined learning embedded with creativity, active imagination, analytical skills and problem solving assimilated into the whole personality, which are the requirements of the jobs in the future. We highlight individual students' values and their contribution towards the social transformation as they are the curators of knowledge in this immersive education which combines the virtual worlds, simulators, learning games and sophisticated digital media.
I have also seek the views of several Malaysian scholars on Industry 4.0 on whether they feel that Malaysian universities are ready to face the technological evolution or otherwise.

Professor Datin Dr. Rubiyah of Malaysia - Japan International Institute of Technology (MJIIT), Universiti Teknologi Malaysia believes that some technologies for Industry 4.0 are already embedded in the university programmes. However, she states that such initiative is "hardly enough to produce the human resource needed for the new revolution."

"Centers like CAIRO of UTM has been gearing up for Industry 4.0 by training Masters and PhD students in Artificial Intelligence and Robotics but not many universities and research centers are actually doing this."

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MALAYSIA BOARD OF TECHNOLOGISTS

She strongly feels that Universities need to produce more experts in the fields required for Industry 4.0 especially at the postgraduate level for a start. "The undergraduate level will take longer period to take off and maybe difficult as the undergraduate engineering programmes will need to have the blessings of the Engineering Accreditation Council for major changes made to the engineering curriculum."

Similarly, Professor Dr. Mohammad Hamiruce of Universiti Putra Malaysia (UPM) hold an opinion that the "universities are fast in adapting to changes and currently moving from producing industry-ready graduates to future-proof graduates."

In a wake to face Industry 4.0, Professor Hamiruce asserts the importance of the universities to produce graduates with higher soft skills who are fully trained with hard skills. He believes that "creativity, innovative and entrepreneurial minds need to be nurtured in order to produce future-ready graduates."

The UPM Professor maintained that "Universities will continue their functions to be leading institutions in research and development, embarking on frontier research regardless of when Industry 4.0 will be fully kick-off."

Industry 4.0 and Students' University Experience

Industry 4.0 is not only about advances in technology. Where curriculum content and pedagogical delivery is concerned, the Ministry is aware of such advancement in learning analytics and has designed the Integrated Cumulative Grade Point Average or iCGPA initiative in order to measure, analyse and report information about students. iCGPA highlights the Ministry's provision of university students' experience towards Industry 4.0. iCGPA is an integrated grading system for assessing and reporting students' academic performance and the professional skills attained during the course of their university study. It also functions as a platform for students to enhance their values and competencies. The assessment adopts a holistic approach by assessing students' learning experience into eight domains of learning outcomes. Through iCGPA, future employers will be able to assess the students' academic credentials and their social engagement and personality traits. At the same token, students will be acclimatized to attain suitable workplace skills and mind set at the beginning of their academic years.

Having said that, he is certain that "universities welcome Industry 4.0 as the graduates with innovative, creative and entrepreneurial mindset produced from the Malaysia Education Blueprint (Higher Education) will definitely be most relevant for the era."

Contrary to the two Professors, Professor Ir. Dr. Noor Azuan of Universiti Malaya reflects the opposite. He considers universities as partially ready to face Industry 4.0. He envisages big investment in people and infrastructure for preparation towards Industry 4.0. Not only that, he also predicts that the curriculum content and pedagogical delivery will require some kind of transformations where collaborations and insights from the industry will be needed.

The above are interesting and pertinent comments coming from the academia as they represent the community who will be training apprentices to face the technological revolution brought about by Industry 4.0.

Industry 4.0 and Students' University Experience

Malaysian Higher Learning Institutions are also ready for Industry 4.0 by way of programmes and course offerings. These programmes were devised by bearing in mind that Industry 4.0 and the digital era are changing the way higher education is managed and giving rise to new expectations. Many of these are hybrid programmes with a focus on Fusion Technology, apt for Industry 4.0:

- Bachelor of Computer Science (Artificial Intelligence)
- Bachelor of Electrical Engineering Technology (Automation and Robotic Technology)
- Bachelor of Information Techology (Gamification)
- Bachelor of Biomedical Engineering
- Bachelor of Bioinformatics
- Bachelor of Automotive Engineering (Autonomous Vehicle)
- Bachelor of Engineering Technology (Renewable Energy/ Electric Transport)
- Bachelor of Engineering Technology (Biomedical Electronic)
- Master of Data Analytics
- Master of Bio-medical Engineering
- Master of Health Informatics

The presence of Industry 4.0 in the public universities is also established via the formation of Centers of Excellence (CoEs). These CoEs are intended to spur higher education institutions (HEIs) competitiveness in various fields of research and development, expertise and services in the national and international levels. Below are some research entities relevant to Industry 4.0:

1. Virtual Reality Centre (VRC) - UM
2. UTM Big Data Centre - UTM
3. Media and Game Innovation Centre of Excellence (MaGICX) – UTM-IRDA
4. Institute for Human Centered Engineering (IHCE) - UTM
5. Centre for Artificial Intelligence and Robotics (CAIRO) - UTM
6. Institute of Microengineering and Nanoelectronics (IMEN) - UKM
7. Centre of Research for Computational Science & Informatics in Biology, Bioindustry, Environment, Agriculture and Healthcare (CRYSTAL) - UM

The diversification of the CoEs highlights the efforts to cultivate and improve the quality and multidisciplinary of research and development pertinent to Industry 4.0. These CoEs predominantly thrive on translational research, another initiative by the Ministry in driving local universities to seek solutions to the problems faced by the industry, academics, government and community. Advances in technologies are employed to realize the Research Priority Roadmap 2017 which addresses the national and global grand agendas through Research & Development, Commercialization and Innovation strategies (RDCI).

How do universities incorporate the exponential change brought about by Industry 4.0?

In developing and strengthening our human capital base, the Ministry is aware of the vital role of the industries in training the younger generation – today and for the future. The two initiatives below focus on human capacity building, academic-industry linkages and the exponential change brought about by Industry 4.0. The design of UNI-Industry collaboration or UNIC, is a commendable initiative that blurs the lines between the university and industry in our effort to ensure that our graduates who will be joining the workforce today and the future years to have the skills and mindset to be employable by emphasizing on their individual talent and personal development.

In regards to the academic-industry initiatives, Professor Datin Prof. Dr. Rubiah believes that universities will be able to embrace the exponential change brought about by Industry 4.0 by "bringing the technology to the industries." She proposes the Ministry to assist in providing the platform for various groups to work together in linking the university and the industry.

Under the Ministry' 2017 'redesigning higher education' agenda, we have introduced various initiatives that will bring our education offerings up to speed with Industry 4.0 changes. Two such examples are our academic-industry initiatives namely the 2u2i and CEO@Faculty program.

The CEO@Faculty program reinforces academic-industry linkages by bringing together top local and international CEOs and industry players into Malaysian universities. Adam Brimo of OpenLearning.com, Lee Sang Hoon of Samsung and Abraham Liu Kang of Huawei are among the technology-company based CEOs selected to share their knowledge and experiences with students and the university community. 10 percent of the 65 CEOs appointed for the program are from the innovation and technology-based industries. These CEOs do not only deliver lectures, but also act as mentors to our lecturers. In fact, beginning 2017, phase 2 of the CEO@Faculty program themed "Coached by the Pros" will see a select group of university lecturers placed at the various companies and undergo industry exposure, including at these technology-driven organizations.

In the 2u2i program, the Ministry upholds the credence that learning is working, working is learning. 2u2i is a work-based learning program aimed at increasing the opportunities of students to enter the digital industry after their graduation. Students spend 2 years at the university to master theories and 2 years of hands-on practice in the industry. The 2u2i program intensifies academia and industry collaborations through seamless blend of learning and industry existence via on-campus teaching factories, teaching firms and teaching hospitals. Leading IT companies such as Oracle, Microsoft, VADS, TM, HILTI and i2M also support the implementation of this 2u2i programmes. The 2u2i programme will be expanded to 16 programmes in the 2017/2018 academic year covering areas such as data engineering, entrepreneurship and bioinformatics.

Conclusion

Industry 4.0 is already here and Malaysia is at the onset of adopting the newer innovative technologies into our higher education ecosystem. Our achievements in the global ranking such as the Times Higher Education World University Rankings is exemplary to our effort in globalizing and escalating Malaysia as the regional education hub. Yet, we should do more at a greater speed in this challenging times. First and foremost, we should work towards agile governance culture across the higher education sector. Agility requires transparency and visibility of open governance practice and I strongly believe that the Ministry should pave the way for it.

The Ministry's big agenda in redesigning higher education through the introduction of various initiatives is not merely aimed at addressing the changes in the higher education landscape worldwide, it also directly addresses the emergence of Industry 4.0 in preparing our graduates for the 21st century challenges as well as addressing the sustainable development issues. Industry 4.0 may indeed have the potential to "robotize" humanity. Nonetheless, we need to shape a future that works for all of us by putting people first and empowering them because everything comes down to people and values. At the end of the day, creativity is innately human and individual touch and caring work cannot be replaced by intelligent machines.

CYBERCRIME: AN EMERGING THREAT OF THE VIRTUAL WORLD

By Dr Mohamad Asmidzam Ahamat

A successful businessman is relaxing in his self-driving car during his journey from office to home. He is very grateful for the integration of cyber-physical system, where an artificial intelligence is now navigating his car safely, much safer compared to when cars were driven by human beings. Along the way, traffic congestion is successfully avoided since the artificial intelligence system receives a tremendous amount of data, enabling route optimization. At his home, air conditioner system and water heater are remotely switched on, the coffee maker machine is heating up; ready to serve a cup of hot coffee by the time the man arrives. Ten minutes before the estimated time of arrival, some warning messages appear on his car's control display. At the same time, his smart phone displays a message; a large sum of his money was transferred to another bank account that he does not recognize, and he never instructed the bank to do so. Before he has the chance to call the bank, his car veers off course, leaving him clueless on what is happening. Fortunately, he manages to regain control and heads home safely after he turns off the self-driving system and disconnects them from Internet. He sighs with a relief. However, the fate of his money is yet to be known. This is one of the scenarios that may happen in the future; something that is unimaginable at present.

Self-driving cars, smart homes and business web are amongst the rising technologies that characterizes Industry 4.0. Adoption of artificial intelligence reduces the necessity for human-controlled processes, an advantage of cyber-physical systems integration. One of the important cyber components is the computer; which are becoming more complex, and its number of Lines of Code is increasing exponentially. Up to three percent of these codes could contain flaws or bugs, which are susceptible to attack by hackers. Some people believe that anyone who can control the code is capable to control the world.

By 2020, all people on this Earth are expected to go online. Thus, we are living in an ultra-connected world where cyber threats are becoming more severe and prolific. Recent attacks by WannaCry and NotPetya ransomware were wake-up calls to us. WannaCry encrypts a computer's files while NotPetya make the entire computer to become inoperable by encrypting the whole segment of the hard drive. Shortly after these attacks, several online trading brokerage firms were then attack by DDoS (distributed denial-of-service). These attacks are capable to affect all systems, as long as they are connected to the Internet, even if the system is physically located at the most remote area. The WannaCry, NotPetya and DDoS are just the beginning of cyberattacks; more are expected to come in the future.

Malaysia's Critical National Information Infrastructure shall be secure, resilient and self-reliant. Infused with a culture of security, it will promote stability, social well-being and wealth creation'

Vision of Malaysia's National Cyber Security Policy

Figure 1: Ten critical sectors as listed in the Critical National Information Infrastructure

Cybercrime is quite different compared to conventional crimes that we are having today. In cybercrime, criminals may remotely control the attack, possibly from a laptop in their home. Instead of attacking one victim at any particular time, thousands or more victims could be affected at once. The weapon used could be recycled, and it could learn to adapt a more challenging resistance imposed by cyber defense system.

Towards the end of the last century, Information Technology (IT) is one of the emerging job opportunities. IT professionals are responsible to ensure smooth and optimized operation of IT facilities. As we are heading towards Industry 4.0, cybersecurity becomes one of the key areas in securing our daily activities. Cybersecurity experts are responsible in preparation of incident report and response plan related to cyberattacks, and conduct necessary investigations. A good cybersecurity team is essential to ensure an establishment of cyber resilient organizations that are able to identify, prevent, and respond to process or technology failures and recover with minimal reputational damage or financial loss.

Out of 193 countries, Malaysia is only behind Singapore and United States in her commitment to cybersecurity, as published in the Global Security Index 2017. This recognition is one to be proud of. Nevertheless, improving ability in cyber defense system is a never ending endeavor.
In the National Cyber Security Policy, ten critical sectors (Figure 1) are listed in the Critical National Information Infrastructure (CNII) to address the risk of networked information. This effort is important to gain confidence from people on the security of cyberspace in Malaysia. For instance, the Digital Free Trade Zone, one of the agenda in Digital Economy requires full confidence on the country digital infrastructure, communication networks, public sectors and businesses.

The Cyber Range Malaysia was established in September 2016 through collaboration between CyberSecurity Malaysia, Cyber Intelligence Sdn Bhd and Universiti Islam Antarabangsa Malaysia. This was the first cyber range which involved training of cybersecurity professionals through cyber war-gaming scenarios that enabled development of their skills and instincts in cyber defensive actions. Alternatively, organizations can test and validate their cybersecurity systems to develop a more resilient network infrastructure and operations. In the next four years, Malaysia has targeted to produce 10,000 cybersecurity professionals to ensure the security of cyberspace. The ability of Malaysian companies to be prepared and recover quickly from cyberattacks with minimal disruption will be one of the key survival factors in the digital economy era.

Efforts to ensure a secure cyberspace would be more fruitful if each of us does our own part. By taking some precautions (Figure 2), we could reduce the risk of becoming a victim in cybercrime. In the near future, computers would control most of our critical system and infrastructures, thus more proactive measures must be taken to secure the cyberspace. Can you imagine what would happen to our energy supply if our smart grid system is attacked by cybercriminals? The results would be catastrophic with damages not just on physical facilities, but it could also lead to loss of life for patients who depend on life-support machines in hospitals. Before it is too late, let us work together in creating a safer cyberspace!

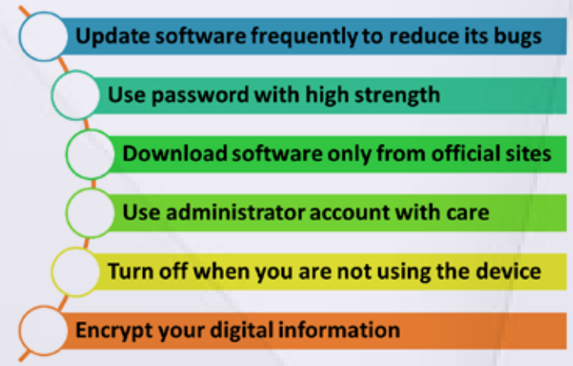
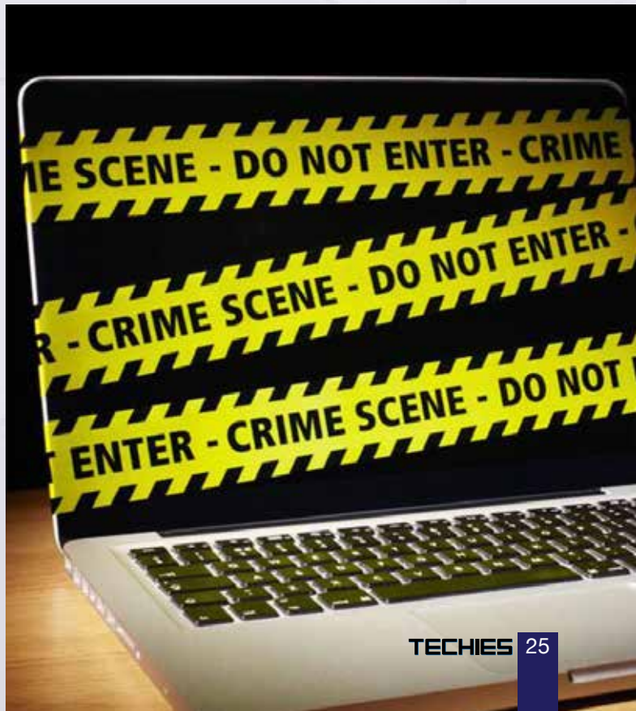


Figure 2: Some tips to protect you from cybercrime



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INDUSTRY 4.0: IMPLICATIONS FOR POLYTECHNIC'S CURRICULUM

By Dr. Naimah Md Khalil

The beginning of a new technological age or revolution known as the "Fourth Industrial Revolution" or commonly known as "Industry 4.0" (I4.0) was announced at the World Economic Forum (WEF) Conference in January 2016. In Malaysia the advent of Industry 4.0 is already accepted and embraced (My Foresight 2016). The Ministry of International Trade and Industry (MITI) says that Industry 4.0 is critical to boost Malaysia's industrial and economic growth and for the country's economy to reach its target of RM2 trillion within the next eight years, as announced recently by Prime Minister Datuk Seri Najib Tun Razak. This underlines that Malaysia's future productivity growth is highly dependent on the capability of the workforce to innovate and to apply advanced knowledge and technologies associated with I4.0. The issue of talent and human capital development is therefore critical to ensure long-term sustainable economic growth and development. Hence, it remains the key challenge for the country (My Foresight 2016).

Malaysian polytechnics are among the biggest suppliers of trained workforce for the nation, providing approximately 55% of TVET workers (Boston Consulting Group 2011). Hence, there is an urgent need for the polytechnics to address and be prepared for challenges arising from the Fourth Industrial Revolution. The starting point is to understand how Malaysian industries are being transformed or going to be transformed by the digital revolution and how these changes will impact the skills and competencies needed. A focus group with the industries was held on 9th August 2017 at Balik Pulau Polytechnic. Moving on from here, the necessary changes in terms of programmes offered, curricula, learning approaches and retraining of lecturers can be planned and implemented.

As stated by Schwab (2016), the inexorable shift from simple digitisation (the Third Industrial Revolution) to innovation based on combinations of technologies (the Fourth Industrial Revolution) is forcing companies to reexamine the way they do business. Hence, smart manufacturing, smart maintenance, and a high degree of automation and integration in all enterprise processes will change current purchase, production, manufacturing, sales and maintenance processes. These changes will impact on business value creation, business models, downstream services, and work organisation. The disruptive nature of these emerging technologies and modified structures for communication and collaboration in I4.0 will transform the existing model of work organization. This in turn will affect the work environment significantly. This transformation of work in all its dimensions will change job profiles and therefore requires workers to be outfitted with a wide range of competencies.

A clear definition of these competencies, as well as the relationship and inter-connection between them, will provide the foundation for competency in the future. This is crucially needed to ensure a successful I4.0 transformation. Hence, job profiles for engineering, information technology (IT), and information system (IS) should be adjusted to include the new competencies required. Many believe that a combination of big data competency with sensors and mobile technology, predictive maintenance, machine learning, process know-how and process management competency is vital. In fact, processes are the focus of I4.0, with automation playing an important role. Since I4.0 will transform business models, business model understanding and entrepreneurship are also important competencies for the skilled worker.

As such, interdisciplinary competency will play a new role. An engineer will have to collaborate with IS and IT specialists in order to achieve results in the interconnected environment that we will face. The domain or analytical oriented competencies like IT, technology affinity, network administration, data security cloud architecture, programming, and in-memory databases will continue to be important in I4.0.

Unlike today's economy that often focuses on a list of domain knowledge and comprise only some very generic behavioral competencies, I4.0 will turn around the work environment where behavioral competencies (for example, customer orientation, decision making, communication, innovating, legal, ethics, self-management abilities and teamwork) will be the most important competencies that skilled workers should have. Currently, the job content of the typical factory worker does not necessitate the application of these skills. However, in a factory of the future, there will not only be significantly more teamwork on the shop floor level, but also more teamwork and communication in daily operations. Due to greater responsibilities and autonomy of the workers, there will be a need for self-management and other broad management skills. A general mindset for continuous improvement and lifelong learning will be valuable as the dynamics of changes in industrial production will only become more intense.

At present, competencies among various disciplines are different. For example, IT will relate to a certain job profile and competency that is completely different from the profile for IS or engineering. However, in future, the competency sets for different disciplines will differ only in some aspects of the knowledge domain. This implies that teaching methods for interdisciplinary teaching should be given due attention.

There are certain qualifications and skills that will become more important in the future due to the shift towards informatisation. This should complement the existing set of qualifications and skills of the skilled workers of today. This means the core qualifications and skills that are practiced in today's technical training, such as basic knowledge about materials or metal processing, will remain as the core of the education of the skilled worker.

In sum, skills and qualifications with respect to IT, data processing, data analytics, process understanding, and the ability to work and interact with modern interfaces are of prime importance for the skilled worker of I4.0. Due to the huge volume of information and the integration of different business processes, workers need to gain knowledge management abilities and an interdisciplinary understanding of their organisation, its processes and the technologies used. Additionally, IT security and data protection will be mandatory. The factory worker of the future will be more a generalist than a specialist.

IMPLICATIONS FOR POLYTECHNIC CURRICULUM

The diagram below (Fig 1) depicts a proposed model of academic programmes to be offered by polytechnics, based on the requirements of I4.0 as discussed.

Fig 1 : Proposed Academic Programme Model for Polytechnics

Fig 1 captures the essence of interdisciplinary programmes in the four clusters of Engineering, Technology/IT, Services and Commerce, where entrepreneurship makes up the centre. The programmes are imbibed with technical and humanistic factors essential to I4.0 – creativity, empathy, stewardship, ethics and moral. Only by doing this will we be able to contain I4.0's potential tendency to "robotise" humanity. The robotisation of humanity would glumly deprive us of our heart and soul, and it is hence incumbent on us all to make sure that humanity prevails (Schwab 2016).

As discussed, the core technology for all the programmes is fundamentally the same. However, in line with I4.0, Science, Technology, Engineering and Mathematics must be strengthened. To add, electives that support I4.0 should be offered. The choice of available electives and the freedom given for students to choose their preferred electives are very important in ensuring that the curriculum is both flexible and relevant to I4.0. The proposed model will enable future work skills of interdisciplinarity, digitisation, agility, design mindset, virtual collaboration and innovation.

Thus, total revamping of the curriculum might not be necessary. Rather, it is a matter of tweaking and using the latest tools and techniques to build the applied skills necessary for I4.0. In terms of programme delivery, it should leverage on a blended learning approach thus encouraging remote learning and therefore life-long learning. Problem-based learning is also needed to close the gap between learning and decision-making. Soft skills development should be strengthened early in the programme, especially the inculcation of the love for learning. Grit (resilience) should also be built into the next generation workforce. Polytechnics should strengthen collaboration with the industry to ensure the relevancy of the programmes and the employability of the graduates. Needless to say, all future programmes should be aligned to I4.0. Courses such as Green Technology, Big Data Analytics, Gamification, Additive Manufacturing, Advanced Composites, Automation (Robotics), Cloud Computing, Building Information Modelling, Mobile Technology and Cyber Security should be incorporated, appropriately.

Graduates who have gone through this proposed academic programme model will have the capacity to become problem solvers and decision makers. They will remain irreplaceable as idea generators and developers of new products and work processes. Their learning experience will provide them the platform upon which their capabilities and skills will continuously evolve into an essential resource base.

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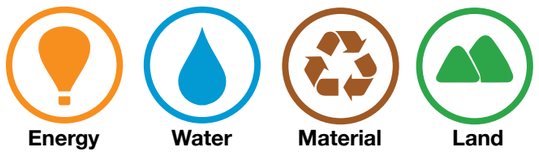
SUSTAINABILITY IN ENGINEERING DESIGN

By Atikah Binti Haji Awang

Most engineering innovations are driven by the need to create, improve, and build practical solutions to problems. Companies rely on innovation to survive, although under some circumstances, economic and social drives may also trigger it. Intended function and performance of a given product are the main reasons for innovation.

In various engineering fields - from electronics to construction, to nano-size components and super scale aircrafts, time is always a constraint. To be the first in the market gives bonus time for a company to reap profits from its investment. However, to stay in the lead, the innovations the company makes in both function and performance must be extended to include sustainability and safety.

Sustainability is about conserving the planet's finite resources so that the needs of the increasing world population are preserved. Efficient use of environmental resources, holistic treatment of innovation towards the environment, and safety issues should be appropriately calculated. To factor-in sustainability, the multi-dimensional interactions between ecological, economical and social systems must be addressed. To add, one must be careful to not shift problems from one area to another.



Minimal hazards and pollution due to the output and waste

Safety is very much a part of sustainability. Besides human safety, safety of the ecological system must also be assessed. If the ecological system is negatively impacted by an innovation, this will affect the health and well-being of human beings. Safety is usually measured by the occurrence of collisions, explosions or accidents, while for sustainability, long-term and gradual effects are used to appraise it. However, both deal with the impact of having innovation. As such, it can be argued that if sustainability is achieved, safety is also achieved.

But how can engineering solutions be made possible in a short time while being sustainable in the long run without negatively impacting the world? Designers need to be aware that the decisions they make should not be all about function and performance only. Beyond those basic purposes of engineering innovations, the unintended consequences of the decisions, particularly the ones that affect human beings and the ecology, must also be considered. Indeed, sustainability is a major concern today and it will also drive the future of engineering innovation.

Just like product characteristics such as performance and quality, sustainability must be planned and built into engineering solutions at the beginning of the problem-solving process. It must be designed on purpose so that it can be achieved intentionally and not by chance. Hence, engineering problem-solving needs an adjustment in the thinking process. Design thinking requires engineers to look beyond responding to the need of the solutions only, but to also think of the way materials are used, the interaction between the users and the solutions, and the interaction between the solutions and the working environment. Solutions should not be formulated just for their intended functions, but also in a way that satisfy user requirements. This is done by predicting the behaviors of the solutions when interacting with the users.

Design thinking requires engineers to identify the need of a solution by understanding the users and the people involved in the many stages of product realisation. It is difficult to achieve a one-for-all solution, since people have different geographic, demographic and psychometric characteristics. A machine or structure designed to operate in temperate climates may not work well in tropical climates due to differing temperature, humidity and other environmental conditions. Even the physique and the behavior of the users could be different. If temperature must be lowered, then a cooling mechanism is required. On the other hand, if it is too cold, then, a heating mechanism is needed. Both mechanisms call for higher energy use.

Ecology

Society

Economy

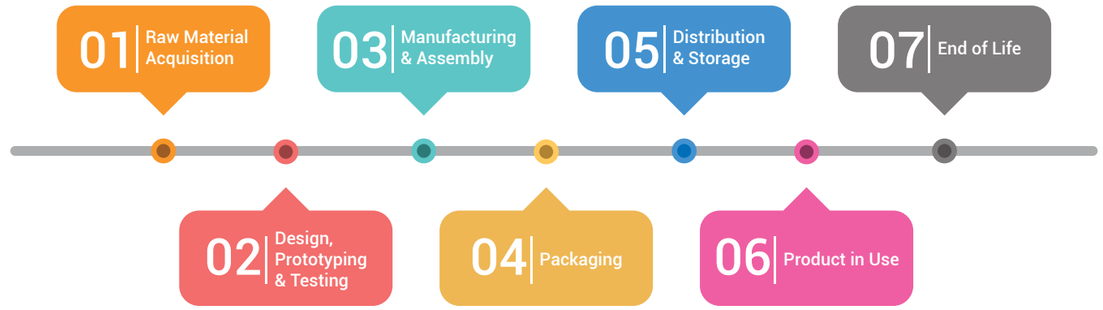


Figure 1 : Life-Cycle Assessment

After the needs of the solution are identified, the interaction between the functions of the solution with each other - , as well as the interaction between users and the working environment must be visualised. Visualisation helps designers understand how a solution impacts people and the environment. Visualisation also recognises the solution's constraints. With this, it is possible to discern the solution's sustainability goals. Designing for sustainability broadens the range of behavior prediction. This means designers must not only predict the behavior of the solution, but also the interactions at different stages of the product life-cycle, including how the raw materials are collected, processed and transported, up to how the physical solution will be disposed at the end of its life-span. To add, the amount of energy required, and how the energy is generated to power the processes must also be deliberated.

Apart from feasibility and viability, sustainability is a feature that must be achieved in any engineering solution. Sustainability by design is basically an assessment of how much it will cost the people and the environment to make the engineering solution physically on hand. It is also about how to use available resources while providing a healthy and functioning environment for future generations.

Figure 2 : Interaction

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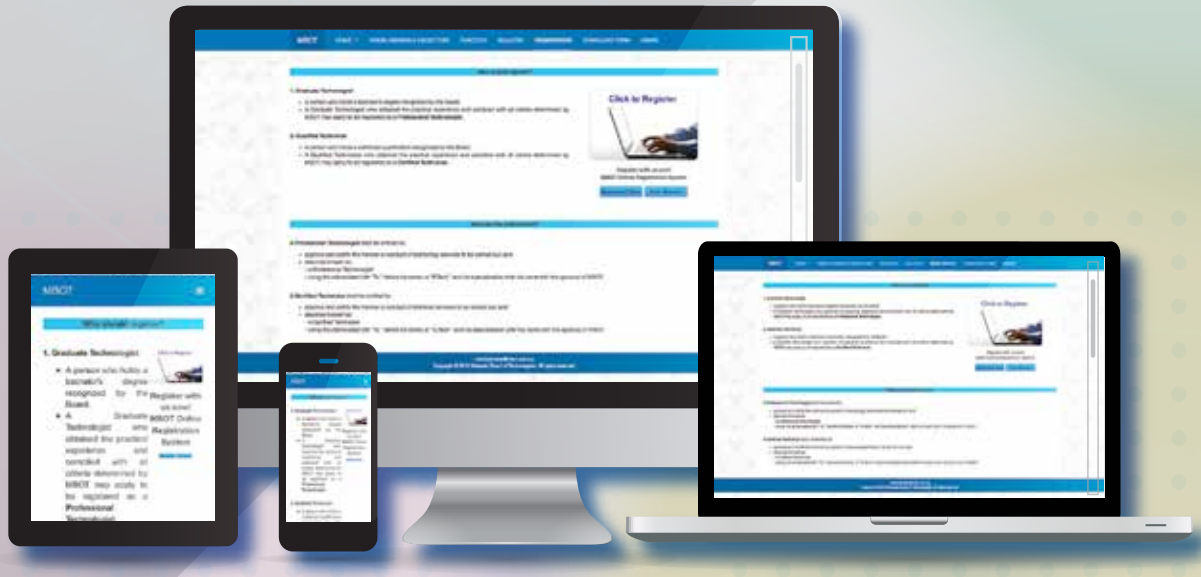

CONTACT US: mbothelpdesk@utem.edu.my
Malaysia Board of Technologists
A1-3-1, Ayer@8, Jalan P8G, Presinct 8, 62250 Putrajaya | Telephone: 03-8800 6268 | E-mail: info@mbot.org.my