

# Assessing the nation's STI standing

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**S**CIENCE, technology and innovation (STI) must converge with economy and finance, geopolitics, society and culture to fuel a robust ideation process for the nation's socioeconomic transformation.

This is the key takeaway within Science Outlook 2017, the recently unveiled second edition of a flagship initiative by the Academy of Sciences Malaysia (ASM), which presents an independent review of key trends in STI in Malaysia and which aims to provide evidence-based insights and new perspectives on the Malaysian STI landscape.

ASM president Professor Datuk Dr Asma Ismail said results from the findings called for transformative thinking, growth mindset, integrated planning and inclusive implementation.

"Malaysia's aspiration to be an advanced nation requires all sectors to have the capacity for developing knowledge capital to fuel Malaysia's drive to be an advanced economy."

"Industry 4.0 has made it more urgent for stakeholders to collaborate in making sure that the country is capable of coping with potential socioeconomic uncertainties brought about by technological upheavals to the global economy."

"The country's progressive and innovative society must have the necessary STI robustness for the country to navigate the deep waters of knowledge-based economy for sustained growth and inclusive development," she said.

Driven by an extensive network of ASM fellows and associates, Science Outlook 2017 tracked where Malaysia is in STI as a nation, identified gaps in relation to where it wants to be in the future, studied best practices and transformation trajectories of other competitive nations, as well as prescriptions to ensure Malaysia's aspirations can be realised.

The report found that coordination of the ecosystem in Malaysia's STI landscape remains a challenge.

Also highlighted was the fact that although Malaysia enjoys a reasonably good position in global competitiveness — holding the 23rd position in the Global Competitiveness Index, 2017-2018, in innovation indices under Pillar 10 on Product Innovation — Malaysia is ranked 130th out of 137 countries.

Science Outlook 2017 chairman Professor Datuk Dr Halimaton Hamdan said the multitude of actors in the national STI landscape has to be revisited.

"Too many actors and funding agencies become self-competing, hence diluting available funding and resources. The weak link between the federal and state governments on the STI issues must also be bridged to cascade policies and decision for effective transformation of the nation towards joining the paradigm shift towards a knowledge-based economy," she said.

As for the country's low rank in innovation, Halimaton said part of the problem lay in the fact that little emphasis was being put on experimental development.

She said research and development (R&D) done in Malaysia was not industry-led, as most of the country's researchers were concentrated in institutions of higher learning.

"If you look at countries like France and Japan, they are now spending more on the experimental

## NATIONAL STI LANDSCAPE



- Too many entities
- Resources/Funds spread too thin
- Weak follow through

### 23 Ministries

#### 157 Agencies under respective ministries

- 1 international council
- 10 councils chaired by Prime Minister
- 16 national councils

#### 16 Agencies under Prime Minister's Department

#### 46 Active, STI-related national policies

#### 20 Public universities

#### 6 Intermediaries

#### 14 State government & federal territories

#### 5 Economic corridors

part of research, which takes findings from the fundamentals to commercialisation and on to application.

"In advanced countries, they do research at all levels, not only at the university-level. Even industries are doing research for product development."

"Researchers in our country are mostly concentrated in universities, and do not receive much funding. The industry should support experimental research at their industries. Researchers at universities should be engaged to do this research for them," she said.

The Science, Technology, Engineering and Mathematics (STEM) talent pipeline also remains a concern.

Halimaton said there was a decline in interest in enrolling in STEM and related fields, and that the quality, based on major national level examination results, was about average.

"Is the STEM field unattractive, or is the pedagogy losing touch with the learning style of millennials? Our survey showed that almost 47 per cent of STEM teachers from secondary schools had not received STEM-related training. Future jobs will be technology-based. There are also critical STEM-related

jobs which may not be filled by national talent, since the numbers are declining."

"But then again, is our industry ready to hire STEM talent? With 98.5 per cent of our industry being small and medium enterprises (SMEs), most do not adopt technology and do not invest in R&D. Only six per cent are creators."

"The productivity of our SMEs is low, the contribution to our gross domestic product is less than 40 per cent, and most SMEs do not have the capacity to hire knowledge workers," she said.

STI enculturation — the process through which science culture become integrated in the mind and habits of the people — was something the report



Science, Technology and Innovation minister Datuk Seri Madius Wilfred Tangau (second from left) with (left) the ministry's secretary-general Datuk Seri Dr Azhar Yahaya, Academy of Sciences Malaysia president Professor Datuk Dr Asma Ismail and Science Outlook 2017 chairman Datuk Professor Dr Halimaton Hamdan (right) at the launch of Science Outlook 2017. PIC BY SUPIAN AHMAD

focused on. STI culture includes scientific literacy, public understanding, acceptance and awareness of science and scientific methods, as well as the applications of science in day-to-day life.

The report found that the Malaysian young public's STI literacy benchmarked against other countries are below the international average. A STI enculturation survey showed that Malaysian adults generally scored below the international average, lower than the adults in most developed countries.

Science culture is highly influenced by the level of education, mass media coverage and cultural mentality. Halimaton said that it was clear that more was needed to make science mainstream in Malaysian culture.

"STI literacy and awareness among Malaysians is low, although engagement is quite satisfactory based on visits to STI spaces. But the content of exhibits can be further updated to follow global trends to increase STI literacy. The STI content in media and the avenue for science communication can be further improved," she said.

According to the report, Malaysia has also yet to fully optimise its collaboration in science diplomacy.

"Globally, Malaysia and prominent Malaysians have stamped their mark in international platforms. However, output through collaborations show that these avenues are not fully leveraged and internal strategising between international divisions of various government ministries needs strengthening to capitalise on opportunities to form collaborations. Tying these loose ends should propel Malaysia's STI ecosystem and innovation to greater heights," said Halimaton.



Asma Ismail

**Is the STEM field unattractive, or is the pedagogy losing touch with the learning style of millennials?**

**HALIMATON HAMDAN**  
Science Outlook 2017 chairman

**LAMPIRAN 2**  
**BERITA HARIAN (SKOR) : MUKA SURAT S60**  
**TARIKH : 18 APRIL 2018 (RABU)**



**Pelajar** menunjukkan produk kreatif yang mampu menyelesaikan permasalahan menggunakan program dibangunkan.

## Mudahkan tugas harian

➔ Robot Meraki ciptaan pelajar STF memiliki struktur kemas, pantas menerima arahan

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► Johor Bahru

**B**agi membantu memudahkan tugas harian manusia terutama bagi tujuan mengangkat, membuang, membaling, mengutip dan menolak barang, mendorong pasukan inovasi Sekolah Tun Fatimah (STF), di sini, membangunkan inovasi robot yang dinamakan Meraki.

Guru pembimbing inovasi sekolah itu, Encik Mat Kamil Deraman, berkata produk yang mengambil masa lapan bulan untuk disiapkan itu diprogramkan untuk menerima arahan bagi menyelesaikan sesuatu permasalahan.

Beliau berkata, penghasilan robot berkenaan adalah merangkumi perbincangan

konsep dan idea, membangunkan prototaip serta uji kaji secara berterusan, sekaligus memastikan kecekapan pergerakan produk itu.

"Robot yang dihasilkan pelajar kami adalah menggunakan barangan pembuatan robot dari luar negara iaitu VEX EDR dan berukuran 18" x 18" x 18" dengan percubaan kali keenam akhirnya berjaya menghasilkan robot yang memenuhi ketetapan diinginkan, iaitu kelajuan, ketangkasan serta kekuatan.

### Menang anugerah

"Bagi membangunkan robot ini, kami menghasilkan prototaip selama dua bulan, menguji produk itu selama tiga bulan serta selebihnya untuk memperbaiki kekurangan yang dikenal pasti memandangkan produk ini menggunakan banyak pengesan, putaran dan motor," katanya kepada *BH Skor*, baru-baru ini.

Januari lalu, robot Meraki berjaya menjuarai Anugerah Reka Bentuk dalam pertandingan *Malaysia Open VEX Competition 2018* yang diadakan di Universiti Multimedia, Cyberjaya.

Menjelaskan lebih lanjut, Encik Mat Kamil berkata, terdapat beberapa faktor menyumbang kepada kejayaan berkenaan seperti kreativiti bentuk ciptaan, kelajuan, kepantasan dan kawalan robot yang menepati kriteria ditetapkan oleh penganjur.

"Robot ini cukup istimewa kerana mampu bergerak seperti ketam, memiliki struktur yang kemas, kuat dan pantas dalam menerima arahan diberikan serta dilengkapi alat pengesan yang baik," katanya.



**Encik Mat Kamil** membantu pelajar membangunkan inovasi Meraki.

### Inovasi Robot Meraki

➔ **Produk** dibangunkan pada Jun 2017 hingga Januari lalu

➔ **Boleh** digunakan untuk memudahkan tugas harian seperti di kawasan perindustrian, rumah dan sekolah

➔ **Kos** penghasilan sebanyak RM20,000 adalah sumbangan Bahagian Sekolah Berprestasi Tinggi (SBT), Persatuan Ibu Bapa dan Guru (PIBG), alumni STF serta badan korporat luar

➔ **Membabitkan** tujuh pelajar Tingkatan Empat iaitu Izzah Syahmina Abdullah Wahab, Nur Aisyah Mohamad, Nur Athira Nabila Lukman, Sarah Imani Zahrol, Hanisah Ismail Fahmi, Ainul Izzah Abdul Rahim dan Nur Haziqah Rumandang



# Pentas **terbaik** pamer teknologi

■ **Persidangan bincang keselamatan, ancaman keganasan**



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**Kuala Lumpur**

**"K**ejayaan Malaysia menganjurkan Persidangan Perkhidmatan Pertahanan Asia 2018 (DSA 2018) serta Pameran Perkhidmatan Kebangsaan Asia (NATSEC) 2018 amat membanggakan dan wajar dipuji," ujar Menteri Pertahanan dan Industri Aeroangkasa Kazakhstan Beibut Atamkulov ketika ditemui di ruang pameran DSA dan NATSEC semalam.

Menurutnya, pameran berlangsung selama empat hari di Pusat Pameran dan Perdagangan Antarabangsa Malaysia (MITEC) di sini, disifatkan luar biasa apabila berjaya mengumpulkan 1,500 pempamer dari 60 negara.

"Pameran itu menghimpunkan pelbagai teknologi dan kelengkapan keselamatan serta pertahanan terkini dari pelbagai negara sesuai dengan cabaran dan keperluan semasa.

"Pameran ini sekali gus membuktikan ekonomi Malaysia yang kukuh dan berkembang. Saya dapat berkongsi pengetahuan dan pada masa sama berpeluang melihat aset pertahanan terbaru," katanya.

Sementara itu Menteri



**HISHAMMUDDIN** menaiki kenderaan Weststar Rapid Ranger yang dipamerkan sempena DSA dan NATSEC 2018 di MITEC, Kuala Lumpur, semalam.



**DR Ahmad Zahid** meluangkan masa melawat pameran DSA dan NATSEC 2018, semalam.

Pertahanan II Brunei Pehin Datu Lailaraja Dato Paduka Seri Awang Halbi Mohd Yussof berkata, DSA dan NATSEC 2018 adalah pentas terbaik untuk berinteraksi dan berbincang mengenai aspek keselamatan serta ancaman khususnya di rantau Asia.

Menurutnya, kejayaan Malaysia menganjurkan

acara itu yang memasuki hari kedua semalam membolehkan pihaknya bertukar pandangan mengenai cabaran pertahanan dan keselamatan pada masa kini.

Menteri Pertahanan Singapura Dr Ng Eng Hen berkata, menerusi pameran itu hubungan bilateral antara Singapura dan Malaysia terutama dalam konteks

pertahanan dapat diperku-  
kuh.

"Paling utama kebaikan persidangan dan pameran ini adalah wakil setiap negara yang terbabit dapat duduk semeja dan berbincang.

"Malah dalam perbincangan saya dan Datuk Seri Hishammuddin Hussein (Menteri Pertahanan) pada hari ini (semalam), pelbagai inisiatif dicadang serta dibincangkan.

"Beliau sendiri (Hishammuddin) memaklumkan ingin melihat pertalian erat dapat dijalin antara Singapura dan Malaysia khususnya dalam mengekang ancaman keganasan yang menular di rantau Asia Tenggara," katanya kepada wakil media selepas menutup Rundingan Meja Bulat Panglima Panglima Tentera Darat yang disertai 19 negara sempena DSA dan NATSEC 2018, di sini, semalam.

**LAMPIRAN 4**  
**HARIAN METRO (SETEMPAT) : MUKA SURAT 65**  
**TARIKH : 18 APRIL 2018 (RABU)**



**BOSNEV** memakai produk yang dihasilkan **Optix**.

**Kuala Lumpur**

### **Peranti optik lihat objek lebih jelas**

Peranti optik untuk operasi pada waktu malam seperti yang digunakan dalam filem aksi Predator antara produk ketenteraan dipamerkan pada Persidangan Perkhidmatan Pertahanan Asia 2018 (DSA 2018) dan Keselamatan Kebangsaan Asia (NATSEC) 2018.

Selain paparan imej yang lebih sempurna, *Night Vision Goggles Operation (NVG)* dan *thermal image* dipamerkan juga tampil dengan rekaan lebih kompak dan moden.

Pengurus Jualan Optix, Peter Bosnev berkata, kedua-dua peranti optik itu amat penting dalam melancarkan operasi pada waktu malam dan masing-masing ada

kelebihan tersendiri.

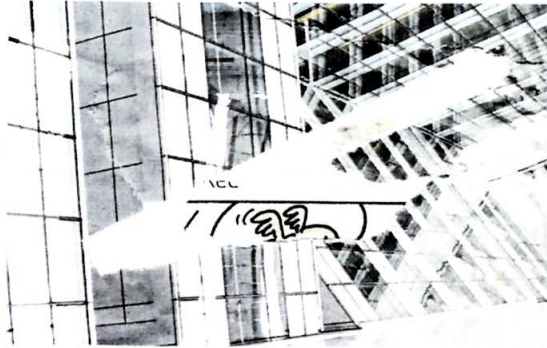
Beliau berkata, *thermal image* adalah peranti optik berkemampuan tinggi yang boleh mengesan pergerakan manusia dan kenderaan.

"Teknologi kami gunakan pada *thermal image* ini menjadikan objek dilihat menjadi lebih jelas dan tepat, jarak operasinya mencapai sehingga dua kilometer.

"Manakala NVG kami hasilkan pula berbeza dengan produk lain kerana teknologi penjanaan tiub empat kali ganda akan menghasilkan imej objek lebih jelas," katanya ketika ditemui di tapak pameran DSA di sini, semalam.

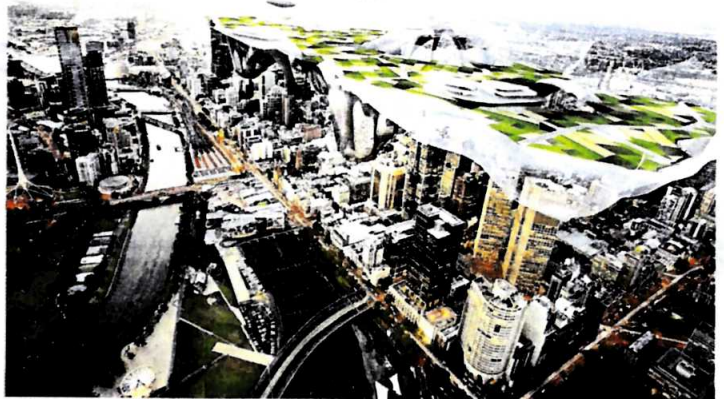


LAMPIRAN 5  
THE STAR (LIVING) : MUKA SURAT 3  
TARIKH : 18 APRIL 2018 (RABU)



Self-healing buildings are not too far off in the future. — 123rf.com

A 'Multiplicity' city of the future. That canopy floating above will cool areas below it and offer space for farming and harvesting water above. — John Wardle Architects



# CITIES OF THE FUTURE

With rapid urbanisation, cities in the future will be embracing advanced technology and innovative concepts.

By WONG LI ZA  
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DID you know that Malaysia is one of the most urbanised countries in East Asia?

According to a 2016 World Bank report, 75% of Malaysia's total population live in urban areas. We're actually ahead of the global trend of rapid urbanisation: As of 2017, 54% of the world's population lived in urban areas, a figure that is expected to increase to 66% by 2050, according to the United Nations Department of Economic and Social Affairs.

With burgeoning urban populations, what does the future of cities look like?

In an article at businessinsider.com, futurologist Dr Ian Pearson predicts that this year, drones will be used for delivery, and by 2045, buildings will be run by artificial intelligence, and there will be vertical cities comprised of mega tall buildings.

Such assumptions are not far off. "Multiplicity" by John Wardle Architects is a vision laid out for Australian city Melbourne, in which multiple cities are built into one huge development comprising various layers and levels.

At the top, a canopy serves as an overlay that cools the space below while providing an area for farming and rainwater harvesting. Transport airships also form part of the picture.

Meanwhile, our very own Medini City in Iskandar Puteri, Johor, is already winning awards for being green and smart. The flagship township of Iskandar Malaysia's urban park developments won awards at the International Greenery, Recreation, Infrastructure, Parks Conference and World Urban Parks Asia-

Pacific Congress last year. It won the Green Champion Award in two categories: "Emerging Green City" and "Smart and Green Infrastructure: Greenfield Development".

Scott Dunn, vice president (strategy and growth), AECOM South-East Asia, says the smartest cities of the future all share these important attributes: a clear, focused vision, and a holistic development approach in growth and planning. (AECOM is a global design, engineering and construction company.)

"They are introducing innovations that are sensitive to the needs of the people and the environment, including better waste management, energy efficient buildings, comprehensive traffic planning, and pollution reduction, while promoting new economic opportunities for the younger generation," he says.

He adds that smart city development trends around the world involve connected, intelligent, resilient and sustainable infrastructure; at the same time, there is also an emphasis on ensuring each city's authenticity and character is maintained.

"Kuala Lumpur embraces this approach, as evident by its commitment to large urban rejuvenation projects like the River of Life, which aims to increase mobility, promote new commercial activity, and clean river waters.

"Beyond physical development, cities such as Chicago, Amsterdam and Singapore are using emerging technologies - from data analytics to sensors and the Internet of Things - to run their districts more effectively and to manage the environment," he says.



Volocopter's flagship two-seater drone is designed for use as an autonomous air taxi in large cities. — Reuters

Dunn feels that one of the key elements of a futuristic city is resilience.

"For one, all cities need more durable elements like resilience and sustainable infrastructure if they want to continue thriving. With the threat of climate change - particularly acute here in South-East Asia but increasingly also emerging in major urbanisations around the world - cities need to be ready to adapt and respond to things like weather volatility, water stress, energy shortages, sea level rises and natural disasters.

"City planning and growth need to take into account these factors when designing things like transport infrastructure, housing, schools and the various public utilities," he says.

## Self-healing buildings

Mushrooms are considered a superfood nowadays thanks to their high protein content, antioxidants, fibre, vitamins and minerals - they're just generally good for human immune systems.

Now, the fantastic fungi's benefits are extending to buildings! According to a recent report, a

type of fungus called *Trichoderma reesei* can be used in a new technique to fill the cracks that develop in concrete to create a self-healing process. If successful, it will be a low-cost, anti-pollution and sustainable material.

The fungi works on micro-cracks, which are often the start of much larger structural problems found in buildings and bridges. If micro-cracks expand and reach steel reinforcement, it will jeopardise the stability of the concrete as well as the reinforcement.

"The steel is exposed to outside elements like oxygen, water, carbon dioxide and chlorides, which causes the reinforcement to rust and break down more quickly. By filling in these micro-cracks, the fungi would ideally be a permanent self-healing solution for the concrete," explains Dr Jin Cong-rui in the report. Jin is an assistant professor in the Mechanical Engineering Department of the State University of New York at Binghamton.

This idea was inspired by the human body's natural ability to heal from cuts, bruises and broken bones. At the independent, academic and research-based news and views site in Australia, theconversation.com, Jin explains that with concrete, the proposal is to mix fungal spores in with nutrients during the initial mixing process when building a new concrete structure.

When cracks occur and water seeps through, the dormant fungal spores will germinate and, as they grow, act as a catalyst within the concrete to "promote precipitation of calcium carbonate crystals" (mineral deposits) that can fill in the cracks.

Although the technique is still in the early stages of research, it has great potential to be a main force in construction.

## Passenger drone taxis

Getting to your lunch meeting or grocery store using an e-hailing service is quite the norm these days. But can you imagine travelling in one that is not only driverless but also airborne?

That is what some cities, such as Dubai, are working towards.

As reported in Sky News recently, Chinese UAV (unmanned aerial vehicle)-maker Ehang was the first company in the world to test-fly a passenger drone taxi with its single-seater Ehang 184 in Dubai in September last year.

The Ehang 184 is described as the world's first autonomous passenger aircraft. The single-passenger vehicle can fly 40km and works like a supersized drone, equipped with eight propellers.

Meanwhile, German drone manufacturer Volocopter took its first passenger for a ride in its flagship two-seater drone during the Consumer Electronics Show in Las Vegas in January, according to Telegraph.co.uk.

The drone is designed for use as an autonomous air taxi in large cities and the company has said it has plans to make its first piloted routes within the next three to five years.

Meanwhile, established ride hailing platform Uber also plans to launch an autonomous drone flying taxi service in Los Angeles by 2020, having signed a deal with US space agency Nasa (National Aeronautics and Space Administration).

Looks like taking to the skies will be a walk in the park pretty soon....



RECYCLING HOPE

# PLASTIC-EATING ENZYME MAY SAVE PLANET

Researchers' accidental creation could be answer to plastic pollution

TAMPA

**R**ESearchers in the United States and Britain have accidentally engineered an enzyme that eats plastic and may help solve the growing problem of plastic pollution, a study said on Monday.

More than eight million tonnes of plastic are dumped into oceans every year, and concern is mounting over this petroleum-derived product's toxic legacy on human health and the environment.

Despite recycling efforts, most plastic can persist for hundreds of years in the environment, so

researchers are searching for better ways to eliminate it.

Scientists at the University of Portsmouth and the US Energy Department's National Renewable Energy Laboratory decided to focus on a naturally-occurring bacterium found in Japan a few years ago.

Japanese researchers believe the bacterium evolved fairly recently in a waste recycling centre, since plastics were not invented until the 1940s.

Known as *Ideonella sakaiensis*, it appears to feed exclusively on a type of plastic known as polyethylene terephthalate (PET), used widely in plastic bottles.

The researchers' goal is to understand how one of its enzymes — called petase — worked, by figuring out its structure.

"But they ended up going a step further and accidentally engineered an enzyme that was even better at breaking down PET

plastics," said the report in the *Proceedings of the National Academy of Sciences*, a peer-reviewed US journal.

Using a powerful X-ray 10 billion times brighter than the sun, they were able to make an ultra-high-resolution 3D model of the enzyme.

Scientists from the University of South Florida and the University of Campinas, Brazil, did computer modelling that showed petase looked similar to another enzyme, cutinase, found in fungus and bacteria.

One area was a bit different, though, and researchers hypothesised that this was the part that allowed it to degrade man-made plastic.

So, they mutated the petase active site to make it more like cutinase, and unexpectedly found that this mutant enzyme was even better than the natural PETase at breaking down PET. **AFP**