

A SESSION WITH
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DATO' SRI DR. ZAKRI
ABDUL HAMID

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ENSURING SUSTAINABLE
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A SYNCHRONIZED
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ENGINEERING AND
SCIENCE IS FUN!

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MIGHT
Malaysian Industry-Government Group
for High Technology

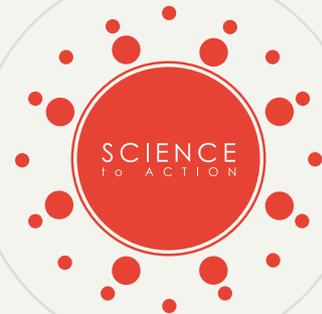
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01/2014

SCIENCE TO ACTION



ENSURING SUSTAINABLE GROWTH BEYOND 2020

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Its key components to its mission are intelligence, research, competency and community. myForesight® raison d'etre is to accomplish the following:

1. Shaping Malaysia's future possibilities;
2. Promoting and mainstreaming of foresighting in national, sectoral and corporate planning;
3. Identification of key technologies to support sectoral development;
4. Identification of key and potential industries from technology perspective;

editor's note

Initial Thoughts



by **RUSHDI ABDUL RAHIM**
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Greetings & Salutations, It is my pleasure to bring you the latest edition of myForesight® magazine, the first of 2014. For this particular edition we're focusing on an initiative launched by our Prime Minister to ensure the nations sustainability beyond 2020 by leveraging on our knowledge and mastery of science. SCIENCE TO ACTION (S2A)!

This call to action for science is seen as timely. The prevailing thoughts outside of scientific community are that so much money and resources have been put into science and yet the results have been lacklustre. Furthermore the benefits on investment are perceived to be benefiting the scientific community and not far reaching enough.

This is a matter of perception, and perception is a powerful tool. Look at Malaysia's 2014 budget and you will be pressed to find the mention of Science & Technology (S&T) importance in nation building. This neglect has been going on for quite some time and has now had its first casualties. Our education, our talents and our students!

In United Nations Development Program (UNDP) Development Report Malaysia is ranked 64th. Though we are categorized as a country with high human development index, it is most disturbing that we are ranked almost at par with the likes of Libya and Serbia. The latest results on Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Survey (TIMSS) also makes for a grim reading. Less than 50% of our 15 year old reach a baseline level for reading, mathematics and science.

Something needs to be done and something is indeed being done. Science to Action is a call for arms for the country to put its emphasis back into S&T. Although the applications of S&T has always been far reaching and benefitted the society as a whole, it is still perceived as an exclusive domain of the scientist and technocrats.

It is often taken for granted the continuing need for S&T in national security, health, and the economy. Furthermore, the challenges the country will face in the future requires that S&T takes a centre stage in helping society develop. This role for S&T will take on increasing importance, particularly as we face difficult decisions related to social, politics and environment.

Therefore Science to Action or better known as S2A attempts to make science relevant and sexy again. Science must not only help and support nation building but must be seen doing so to ensure its importance is acknowledged and not forgotten.

Since S&T is very much regarded as having a multiplying effect, the successful implementation of the S2A will see Malaysia's economy resembling other developed nations which has S&T as its cornerstone of development.

As usual, we hope you find the magazine beneficial and thought provoking.

We expect you to have your opinion on certain matters. We want to hear them if you are willing to share. We welcome your feedback and contributions.

It is often taken for granted the continuing need for S&T in national security, health, and the economy. Furthermore, the challenges the country will face in the future requires that S&T takes a centre stage in helping society develop. This role for S&T will take on increasing importance, particularly as we face difficult decisions related to social, politics and environment.

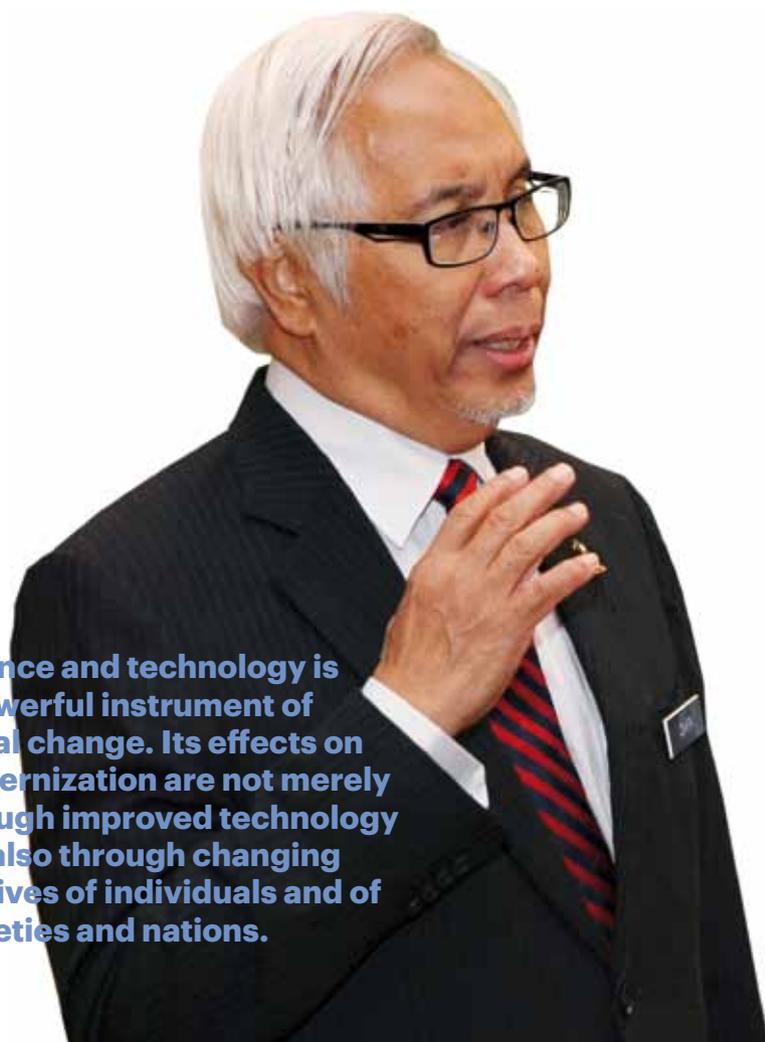


“...In United Nations Development Program (UNDP) Development Report Malaysia is ranked 64th. Though we are categorized as a country with high human development index, it is most disturbing that we are ranked almost at par with with the likes of Libya and Serbia.”

leader's insights

A session with Professor Emeritus Dato' Sri Dr. Zakri Abdul Hamid, Science Advisor to the Prime Minister of Malaysia on the **Science to Action (S2A) Programme**

Science and technology is a powerful instrument of social change. Its effects on modernization are not merely through improved technology but also through changing the lives of individuals and of societies and nations.



The Essence

Science is central to modern culture and need to be promoted through improvements in both the education system and public engagement. This is crucial because, unless society is enthusiastic and informed about science, the scientific research endeavour risks coming under threat – jeopardising the benefits that science can bring to humanity.

Since the industrial revolution, the growth of economies throughout the world has been driven largely by the pursuit of scientific understanding, the application of engineering solutions, and continual technological innovation.

Scientific advances and technological change are important drivers of economic performance. The ability to create, distribute and exploit knowledge has become a major source of competitive advantage, wealth creation and improvements in the quality of life.

It is easy to see why. Much of our everyday lives in Malaysia, as in many other parts of the world, are the product of investments in R&D and in the education of scientists and engineers. We enjoy and rely on world travel, inexpensive and nutritious food, easy digital access to entertainment, instant communication, mobile phone, computers, cars, etc. From the mighty to the mundane, science is at the crux of economic development.

... and it's Universal

Science is more than the tools for advancing the cause of one nation. Global challenges such as climate change, food, water, and health and energy security all feature highly on the agenda, and require politicians to engage with science globally and locally in order to identify sustainable solutions. There is also an important role for science in addressing concerns such as poverty alleviation, sustainability and diversity.

Science has become more global and networked. Science is not just being conducted in more places than ever before, but it is also more interlinked. To give an example, this year's Nobel Prize in Chemistry was awarded to three researchers for work that did not involve test tubes or lab coats. Instead, they explored the world of molecules virtually, with computers. Such numerical simulations enable the closer study of complex reactions like photosynthesis and combustion, as well as the design of new drugs.

Rising the Science Profile

Time and again, we have seen that science leads countries to greater heights and propels them forward, thereby increasing both their economic status as well as the quality of lives of their citizens.

In the years to come, more and more countries will be investing in science. The league tables of science, so long dominated by the 'scientific superpowers' such as the USA, Western Europe and Japan, are in flux. Soon, countries such as China, Brazil, India and South Korea are set to assert themselves even further, along with newly emergent scientific nations in the Middle East, South-east Asia, North and South Africa, and middle-ranking industrial countries such as Canada and Australia as well as some of the smaller nations of Europe.

With all these new trends and developments Malaysia, which is aspiring to become a high income nation, we cannot afford to be left behind.

Malaysia needs to reinvigorate science so that it is ready and able to generate the big new ideas and game changing strategies that will create wealth and jobs for her people.

R&D bullish year ahead

Global R&D expenditures over the past decade have grown faster than the global GDP, an indication of widespread efforts to make economies more knowledge and technology intensive. The global total R&D expenditures increased from an estimated USD\$522 billion in 1996 to approximately USD\$1.3 trillion in 2009, with the rate of growth slowing in the 2008-09 recession years. The steady and strong upward trend illustrates the rapidly growing global focus on science through R&D.

In the case of Malaysia, over the last few years and including for this year's budget, an annual sum of RM600 million has been allocated to local research universities to undertake R&D. Malaysia's investment of 1.07% of GDP is still much lower than that spent by industrialized and developed countries, but higher than those allocated by developing countries which averaged lower than 1%.

...an instrument of social change

Science and technology is a powerful instrument of social change. Its effects on modernization are not merely through improved technology but also through changing the lives of

individuals and of societies and nations.

Malaysia has a strong commitment to the development of science and technology. We are aware that we cannot provide for the welfare of our people unless we can develop and sustain a strong technological and scientific base. We need to reinvigorate science so that it is ready and able to generate the big new ideas and game changing strategies that will create wealth and jobs for our people.

This is one of my main concerns – that whatever we do – whatever is being proposed by the scientific community, must eventually have a positive impact on the livelihood of the *Rakyat*. I realize that this is not going to happen overnight. But a comprehensive plan which addresses the needs of the immediate, combined with the imperatives of the future, must be hatched to position science as a key engine of our national economic prosperity. By science, it is my understanding that it not only refers to the natural sciences – but also the social sciences: those disciplines which are increasingly crucial in our current quest to strengthen our national unity.

Science to Action (S2A)

Last year on November 1, I launched the Science to Action (S2A) initiative. Its aim is to intensify the application of science and technology for industrial development and the *Rakyat's* well-being. It is also to support the New Economic Model which I introduced in 2010.

The S2A initiative has three key components: Science to Industry, Science to Well-Being and Science to Governance.

Science to Industry focuses on establishing an innovation culture and strengthening industrial capabilities to generate new wealth. This includes efforts to foster the Silicon Valley's culture of "Innovate or Perish" which I observed during my recent trip to San Francisco. The key to this must be to encourage government-linked companies and small and medium enterprises (SMEs) to venture into new potential growth areas, offering potential multifold returns on investments. This will also increase the number of start-up technology-based companies especially among young scientists and entrepreneurs of both genders. Government will create a more conducive environment for entrepreneurs and companies to venture into high-tech investments, building a capability to meet local needs and creating

The ability to create, distribute and exploit knowledge has become a major source of competitive advantage, wealth creation and improvements in the quality of life.

opportunities for the export of high-value products and services.

Science to Well-being, on the other hand, aims to upgrade the *Rakyat's* standard of living through the usage and mastery of science, technology and innovation. Now being implemented by the Education Ministry, this initiative will also emphasize excellence in the national education system, especially in the fields of science, technology, engineering and mathematics (STEM).

Last but not least, Science to Governance focuses on strengthening public and private delivery systems to create an environment which generate and nurture a culture of scientific excellence among Malaysians. This core initiative will be spurred through the Third National Science, Technology and Innovation Policy overseen by the Ministry of Science, Technology and Innovation (MOSTI).

Beyond Science

By 2020, I would like to see, through the implementation of the Science to Action initiative, Malaysia being one of the top ten countries in the Global Competitiveness Index and the Global Innovation Index respectively.

It is also my hope that through an improved science governance system, there will be more focus and co-ordination in doing R&D among the various ministries and government agencies, in addition to a better participation of the private sector, both home-grown and the multinationals present in the country.

I fully recognize the important role of everyone to generate ideas for the government to pursue its agenda of building a resilient and prosperous nation, indeed, a developed nation by the Year 2020. I welcome constructive inputs from everyone as we strive towards attaining our national aspirations. Continuous engagement with the scientific community is significant in making this a reality.

★ CONGRATULATIONS TO ★

PROF. EMERITUS DATO' SRI DR. ZAKRI ABDUL HAMID
on the conferment of the world's most prestigious
environment prize

“Humans have changed ecosystems more rapidly over the past 50 years than in any comparable period of human history.”

Zakri's dedication and commitment in global environmental leadership including being the founding Chair of the UN Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), member of UN Secretary-General Ban Ki-moon's elite Scientific Advisory Board (SAB) and co-Chair of the Millennium Ecosystem Assessment report has earned him this prestigious award-winning. Zakri shares this year's Zayed Prize for Scientific and Technological Achievement with Indian scientist, Ashok Khosla.

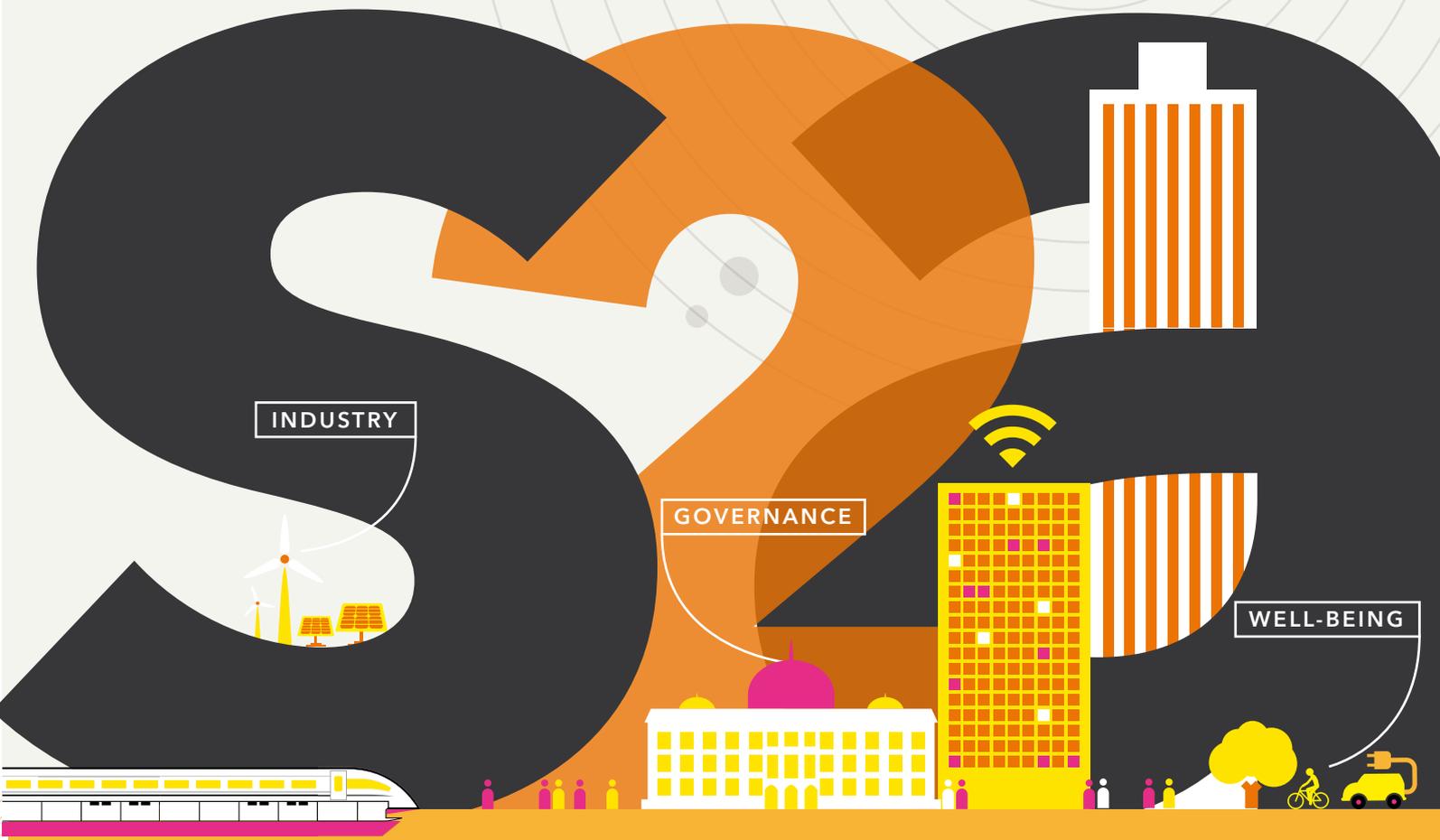
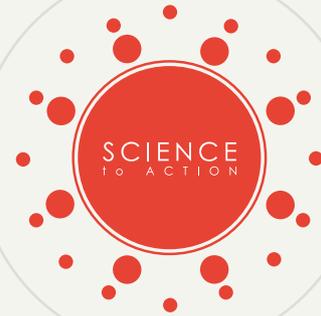
The Zayed International Prize for Environment was established in 1999 by Sheikh Mohammad Bin Rashid Al Maktoum, United Arab Emirates VicePresident, Prime Minister and Ruler of Dubai. Named after a great statesman and a dedicated environmentalist, the Zayed International Prize for the Environment is meant to recognize and encourage environmental achievements that have substantial impact on policies and actions of sustainable development in line with the vision and development philosophy of the late Sheikh Zayed Bin Sultan Al Nahyan, Father of the United Arab Emirates.



Zayed International Prize for the Environment website, citing selection criteria: <http://www.zayedprize.org.ae/>

COVER STORY

SCIENCE TO ACTION: ENSURING SUSTAINABLE GROWTH BEYOND 2020



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The implementation of various national initiatives ensures that Malaysia forges ahead in our goal to become a developed nation by 2020. However, in order to have sustainable growth beyond 2020 and stay ahead of her economic competitors, and to ensure that the efforts made through these initiatives are not laid to waste will take continued focus and investment in science and technology (S&T).

To reflect this emphasis in S&T, the Malaysian government will now be embarking on a Science to Action (S2A) Program. The S2A is an effort that will enable Malaysia to sustain its growth beyond 2020. →



OUTLINING S2A

When?

Now!

Who?

By all and for all

- Government
- Industries & SMEs
- Public
- Academia
- Youth



What?

Intensification of STI for national development

- **Complementary & supportive**, Permeate all government initiatives
- **Inclusive, not exclusive** Benefits all

Why?

Foundation, backbone towards developed nation

- Economic Competitiveness
- Expanding Opportunities
- Improving & Enhancing Lives
- Responding to Challenges

How?

Three (3) Thrusts

- Industry
- Well-being
- Governance

Private-Public Partnership

60:40 model



Launching of S2A Initiative on the 1st November 2013

From left: Tan Sri Datuk Dr. Ahmad Tajuddin Ali, Dr. Mohd Yusoff Sulaiman, Datuk Seri Idris Jusoh, Dato' Sri Dr. Zakri Abdul Hamid

COMPLEMENTARY AND SUPPORTIVE

The Malaysian government has already created programs which place respective priority to propel the economy. S&T will be complementing the existing and future development plans with S2A Program forming the critical piece of the puzzle.

The emphasis and focus of S&T requires foresight and patience, which is the norm of developed nations that have put S&T as the cornerstone of their development.



THE EMPHASIS AND FOCUS OF S&T REQUIRES FORESIGHT AND PATIENCE, WHICH IS THE NORM OF DEVELOPED NATIONS THAT HAVE PUT S&T AS THE CORNERSTONE OF THEIR DEVELOPMENT.



GOING BEYOND THE NKEAS

S&T will provide a multiplying effect to the NKEAs (National Key Economic Areas), expanding the opportunities identified and help sustain them in the long term.

However, in envisioning the future, there are other considerations such as social and environmental impacts, safety and security of the country that need to be taken into account. These are areas that need to be addressed due to its strategic nature for national development; areas that touch the lives of the people.



INCLUSIVE, NOT EXCLUSIVE

The S2A is developed to be inclusive, and not exclusive, in nature.

Although the applications of S&T has always been far reaching and benefit the society as a whole, it is still perceived as an exclusive domain of scientists and technocrats. Therefore, while acknowledging the continuing need for S&T in national security, health, and the economy, the challenges the country will face in the future require that S&T takes a centre stage in steering the balanced socio-economic development.

This role for S&T will take on increasing importance, particularly as Malaysia faces difficult decisions related to social, politics and environment.

WHY SCIENCE TO ACTION PROGRAM?

Malaysia has been quite successful in capturing the benefits of the scientific and engineering enterprise, and has emerged as a leader amongst developing countries. Continued focus and investment in S&T will ensure Malaysia enjoys sustainable growth beyond 2020 and stay ahead of her economic competitors.

Malaysia's S&T capabilities will provide confidence and optimism in her ability to manage the challenges ahead as well as solve issues and problems through application of technological solutions.

As a nation, Malaysia must continue to improve; and S&T is critical in driving this improvement. The emphasis and focus in S&T will enable the country to improve the lives, health, and sovereignty of her population.



ECONOMIC COMPETITIVENESS

A lot have been made by how technology serves as a catalyst for economic growth. Lesson learned from other developed countries is that Malaysia can ill afford to be complacent and risk be overtaken by her competitors. Jobs created under current initiatives could easily be lost if there is no necessary intervention to sustain it.

Initiatives under the S2A program will ensure that Malaysia develops and acquires the required S&T capacities and capabilities to remain competitive.



* Selected S&T sector contribution until 2020



EXPANDING OPPORTUNITIES

USD 10 TRILLION ANNUALLY Potential Economic Benefits from Technology Globally

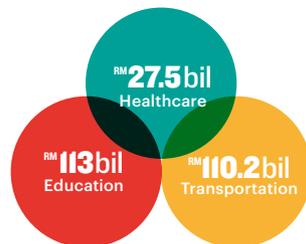
S&T will enable the country to benefit, through expanding existing opportunities as well identifying new opportunities.

Globally, estimated potential economic impact of technologies will be up to USD 10 trillion annually; depending on types and applications. Therefore, it is imperative Malaysia partakes in this development or risk being unable to benefit from the technological developments.

S2A will ensure that Malaysia benefits from these technology developments potential.



IMPROVING & ENHANCING LIVES



Spent for the last 13 years (2000-2013)

The prevalence of S&T in today's society is remarkable. Transportation, communication, agriculture and medicine are some of the sectors of the society that have and will continuously profit from advances in technology.

This has enabled the population to also benefit from the progress made; thereby improving and enhancing their lives.

Correspondingly, S2A will enable continued emphasis in this area to ensure improved quality of life for the people.



RESPONDING TO CHALLENGES

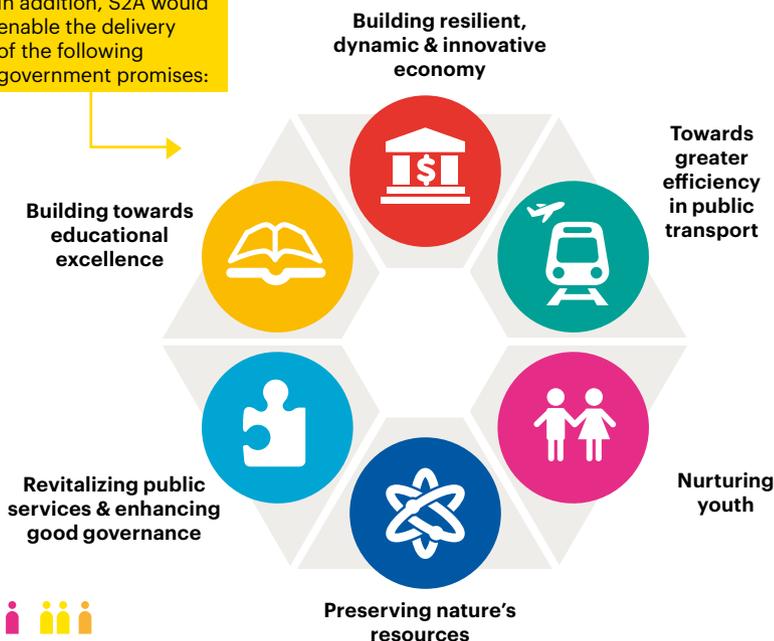
Malaysia continues to grow and develop in a world that has witnessed vast changes. However, she is facing new challenges such as new and lethal diseases; environmental and natural disasters; depleted natural resources; information and big data.

S&T capabilities will provide confidence and optimism on Malaysia's ability to manage the challenges ahead, as well as solve issues and problems through application of technological solutions.

Again, S2A program will enable the country to develop the necessary competencies to respond to these challenges.



In addition, S2A would enable the delivery of the following government promises:



HOW?

S2A Program is complementary, supporting the various existing initiatives that have already been undertaken by the government. It is formulated to ensure the nation maximize its potential by realizing the use of S&T.

To realize these potentials, the S2A will be implemented via the following strategies:-

- Strengthen**
Strengthening of S&T Governance
- Expand**
Expanding beyond scientists and technocrats
- Focus**
Focusing on few targeted areas
- Drive**
Driving the role of private sector in S&T development.





▶ S2A FRAMEWORK?

To deliver the government's promise, S2A is organized into the following framework:



Science for Industry

With the objective of strengthening current industries, creating new industries and entrepreneurs through identification of new growth areas as well as to increase private sector participation in S&T development;



Science for Well Being

Improve the quality of lives of the population through the use of S&T. This will include popularization of science and improvement on the uptake STEM;



Science for Governance

Strengthen the public services and governance to ensure a conducive eco system for the development and uptake of S&T.

IN ENVISIONING THE FUTURE, THERE ARE OTHER CONSIDERATIONS SUCH AS SOCIAL AND ENVIRONMENTAL IMPACTS, SAFETY AND SECURITY OF THE COUNTRY THAT NEED TO BE TAKEN INTO ACCOUNT.

▶ HIGHLIGHTS S2A PROGRAM FOR 2014

- i. Initiatives geared towards creating sustainability of strategic resources. To enable Malaysia's **energy security, water security & food security**
- ii. Initiatives to protect & conserve the nations natural resources as well as leverage on Malaysia's **Bio Diversity as an economic source**
- iii. Inculturization of science as well as **Career in Science** initiatives to ensure the nation have **sufficient science & technology expertise & workforce**
- iv. Technical & up-skilling program for youths that does not qualify for IHL/University; involving up to **100 thousand youths** nationwide
- v. Industry development program via Public Private Partnership in selected technology sector. Driven by the Private sector utilizing **60:40 model**
- vi. Creation of technology **startups** entrepreneurs under the guidance of GSIAC
- vii. Review of **Government Technology Acquisition** to enable the growth of local technology companies

S2A: Leader's Lead
From Left:

Dr. Mohd Yusoff Sulaiman
Tan Sri Datuk Tee Hock Seng
Tan Sri Datuk Dr. Omar Abdul Rahman
Tan Sri Mohd Sidek Hassan

Afidah Mohd Ghazali
Dato' Sri Dr. Zakri Abdul Hamid
Datuk Seri Idris Jusoh
Tan Sri Datuk Dr. Ahmad Tajuddin Ali

Datuk Dr. Madinah Mohamad
Tan Sri Dato' Mohd Bakke Salleh
Dato' Rosli bin Sharif
Tan Sri Ahmad Zaharudin Idrus



insights & viewpoints



Orchestrating a Synchronized STI Framework



by
**Prof. Datin
 Paduka Dr.
 Khatijah binti
 Mohamad Yusoff**



Dr. Vilasini Pillai

The Malaysian government has adopted bold initiatives such as the New Economic Model (NEM) to assure the realization of Vision 2020.

The broad strategic directions of the Economic Transformation Programme (ETP) incorporating, among others, the **12 National Key Economic Areas (NKEA) and 8 Strategic Reform Initiatives (SRIs)** have been introduced to ensure that the country moves forward towards its goal of becoming a prosperous, sustainable and an inclusive economy by the close of this decade.

Malaysia's goal of becoming a high income nation by 2020 will be achieved by a scientifically aware society that is innovative and forward-looking. Hence, the importance of science and technology in helping to reach the core objectives of Vision 2020 cannot be understated.

Realising that STI are central to propel the socio-economic landscape of the nation, it is imperative that we strengthen the position and define the vital role that STI can play in the government's transformation agenda. The Ministry of Science, Technology and Innovation (MOSTI) has formulated the National STI Policy (NSTIP) with a ten-year agenda to make Malaysia more competent and competitive in STI through strengthening existing strategies while charting new, bold and creative ones in critical areas to move ahead in a globally competitive world. The

general thrust of the NSTIP is to strengthen our basic foundations namely, our competency in generating and deploying knowledge through STI, strengthening our STI human capital, elevating the innovative potential of local industry, enhancing STI governance as well as developing a Malaysian society that is sensitised to STI. The Policy and its implementation plans will undoubtedly unleash a new vigour for science that will propel the nation's economic trajectory to a higher plane.

Malaysia's STI position has improved tremendously over the years through the various Malaysia Plans. Increasing emphasis has been placed on building Malaysian STI capabilities through steady increases in R&D funding and the establishment of a number of policies and programs. Despite this upbeat trend, our performance pales when compared to countries like the Republic of Korea, Taiwan or Singapore. We are plagued by many concerns; declining interest in science at schools, investments in scientific research not translating into commerce, unfocused research and development, business not taking science seriously, scarce talent in science.

In these thriving nations, it is a robust institutional framework that enables an efficient STI-led development. These countries have witnessed impressive economic performance in recent years as they have legislated important aspects of the STI agenda like the funding, monitoring and evaluation ecosystem and having an oversight body that strategizes, plans and sets directions for STI investments. These nations have also made heavy investments in STI leading them to become the formidable giants in today's competitive world. The prerequisites and components of a successful innovation ecosystem are simply these: a multi-disciplinary collaborative network, a creative research culture, well-funded assets and the presence of strong STI governance. When these and other factors are combined in the right mix, the result is innovation, productivity, and prosperity. A Science Act will provide more teeth to a new institutional framework of science governance.

We need to build on our strengths and address our challenges urgently and systematically. The STI framework must be enhanced through the Science Act to ensure sustained commitment by the Government and industry

for STI, improved transparency, accountability, partnerships, the widespread promotion of entrepreneurship and safe and responsible use of STI.

The Malaysian public research institutions and universities termed collectively as the Public Research Assets (PRAs) have played a dynamic role in conducting R&D, thus supporting the national agenda of national development and wealth creation.

Research in Malaysia has a long history, dating back to the 1900 when the British Colonial initiated research activities with the establishment of institutes on the cultivation and processing of rubber and research in

tropical medicine. Since then, more and more Public Research Assets have been established and these investments play a critical role in the innovation process by bringing new products and services to marketplace.

Aside from the contribution of these institutions to the socio-economic development of Malaysia, the demands and expectations from these institutions have been increasing and changing given that the Government has aspired to move the nation to become a developed nation by 2020.

The Global Science and Innovation Advisory Council (GSIAC), chaired by the Prime Minister of Malaysia, as well as the Economic Planning Unit (EPU) strongly felt that at this stage of new technologies, paradigms, expectations and demands, that the current state of the nation's PRAs be critically reviewed and closely examined to ensure their continued viability and vitality in the face of global competitiveness and impact.

The NSRC was given the task to undertake this study to take stock of the current state of the PRAs, identify the gaps between expectations and performance, and benchmark the PRAs

against countries of comparable means. The study found that the research ecosystem in Malaysia requires a thorough realignment with respect to policies, governance, human capital, culture and work practice, funding and a support system. The study's findings and recommendations have to be implemented expeditiously and thoroughly to overcome stagnation and potential reversal of earlier accomplishments of the nation's PRAs.

The Science Act will enhance our PRAs and enable them to have a substantial impact on the nation. Such commitment will be completely in step with the current push for the Public Service Delivery Programme with the emphasis on performance and accomplishment.

The 12 National Key Economic Areas (NKEAs) and 8 Strategic Reform Initiatives (SRIs) have been introduced to ensure that the country moves forward towards its goal of becoming a prosperous, sustainable and an inclusive economy by the close of this decade.

NSRC together with MOSTI and other key stakeholders has come up with a rough framework of the Science Act to bring the STI agenda to the forefront of this nation's aspirations. It will help to drive science in a more coordinated and strategic way. A sound institutional and regulatory framework is central to an effective and well-functioning STI system. Since matters pertaining to STI transcend all ministries and involve the participation of various stakeholders such as civil servant, industry, academia and the community, issues pertaining to coordination, collaboration and harmonisation assume importance.

The need for an entity, similar to the National Science Foundation of the US and the National Research Foundation of Singapore, to manage all R&D funding is crucial to the implementation of all research programmes effectively, efficiently with a coordinated and proper evaluation and monitoring system in place to ensure maximisation of all public R&D funds. This will ensure that research is more focussed, targeted and streamlined to crucial areas of concern for our nation as well as meet the demands of our transformative policies towards a high income nation.

“We need to revitalize the STEM education in schools by improving our eco-system – upgrading the labs, quality of teachers, and so on.”

YBhg. Prof. Datuk Dr Halimaton Hamdan
Vice Chancellor,
University Malaysia of
Computer Science &
Engineering



“The *Rakyat* must come in the knowledge based system or production, not as consumers but as producers. We need an integrative mechanism – creative engagement platforms that combines both physical and informational – a high trust environment which brings in the main three stakeholder (Government, Private sector and *Rakyat*) together in order to create a high innovative society.

“We must have comprehensive human development so that S&T can really become the prime mover for change and development.”

Y.M. Tengku Datuk Dr. Mohd Azzman Shariffadeen
Fellow, Academy of
Science Malaysia



about S2A

What People Are Saying

“We are to ensure that the research we undertake would be something that can be commercialized in due cost so that we can make it more sustainable.”

YB Senator Dato’ Sri Abdul Wahid Omar
Minister, Prime Minister’s Department



“Science to Action program for Well Being aimed to improve and enhanced the quality of the life of the ‘*Rakyat*’.

“‘Rimbunan Kaseh’ project provides not just jobs, but also address most of the socio-economic issues we faced currently.”

Dr. Raslan Ahmad
Senior Vice President, MIGHT

“We need to address the accessibility, awareness, recognition and appreciation issues when deal with grass root idea and product.”

Dr. Mazalan Kamis
CEO, Yayasan
Inovasi Malaysia



“Malaysia’s success in the past comes from the Government’s incentives to attract industries here.”

YBhg. Datuk Nicholas Zefferys
Past Governor, AMCHAM/NEAC/Pemudah

“Well-being issue may be nebulous to some but if we don’t fix it, whatever Science and Technology we have will go down the drain.

“The United Nations talks about Gross National Happiness to measure quality of life. It is about cultural values, environment, good governance and sustainability. So, I hope we will not miss this so that your science and technology will be a balance science and technology.”

YBhg. Prof. Tan Sri Dato’ Dzulkifli Abdul Razak
Vice Chancellor,
Albukhary
International
University



“MOE will play a big role in S2A by emphasising on S&T and STEM.”

YBhg. Dato’ Prof. Dr. Morshidi Bin Sirat
Director General of Department of Higher Education

“We need to inspire and create interest for the young students to study Science and Engineering. This would be a good thrust for both the Industry and Government to play their roles.

“We need to relook on how we incentivized our company to become real entrepreneurs and do well in the market. We need to incentivized design and development.”



YBhg. Dato’ Wong Siew Hai
Chairman, AMCHAM’s Malaysian American
Electronics Industry Association (MAEIA)

“WE NEED TO FIND AND IDENTIFY OUR NICHE AREAS IN SCIENCE BEFORE WE CAN START TO CREATE AN ECO-SYSTEM OF HIGH VALUE RESEARCH.”

Saifol Bahri Mohamad Shamlan
Deputy Chief Executive, SME Corporation
Malaysia

“The main intention of Science to Action Program for Industry is to intensify the application of Science and Technology for economic growth.

“The identified gaps and priority areas will then be channeled with the appropriate resources and, for the propose of implementation of our Science to Action programs, we must employ the right approach through Private-Public Partnership, private sector initiatives including those under the ETP, and Government acquisitions.

“We must also take into account the participation of GLCs in making the Science to Action program successful, especially in terms of their roles and commitments in investing in science and technology, as well as developing high tech SMEs.”

Datuk Ir. Kamarulzaman Zainal
Senior Vice President, Industry Intelligence,
MIGHT

“We need both the private sectors and universities collaboration in addressing the issue of intensifying talents within the industry. We are talking about trying to increase the numbers from 58.2 per ten 10,000 workforce as of now to 70 in the year 2020.

“We need to energise the industry which is similar to the one of the thrust of the Science to Action, Science for Industry. But in this respect, in order to be fair to the industry, we have to consider that the bulk of them are the SMEs. We have to inculcate greater innovative culture especially for the SMEs and the banking system would have to continuously support them despite the risk of failure.

“Greater awareness programs need to be created to engage the public into the whole process. These programs include rationalizing the existing strength within our PRIs and universities, transforming the current information system, and align pockets of information system on STI at various locations so that we could come up with a common STI portal.”

YBhg. Dato’ Dr. Rosli bin Mohamed
Secretary General,
Ministry Of Science,
Technology &
Innovation



about S2A

What People Are Saying

"... improve on the 'Action' part in the framework and have a coordinated system."

"Not to disregard youth who are not accepted to universities."

YM Tengku Dato' Sri Azmil Zahrudin
Khazanah Nasional Berhad

"TO MOVE FORWARD IN S&T WE NEED GREATER COLLABORATION, CROSS FERTILISATION, AND SOMEONE TO CHAMPION SCIENCE. BALANCING THE DEMAND AND SUPPLY IN STI IS EQUALLY IMPORTANT – (DEMAND FROM THE PRIVATE SECTOR; SUPPLY THROUGH THE EDUCATION SYSTEM)."

Wan Portia Hamzah
Senior Fellow, ISIS

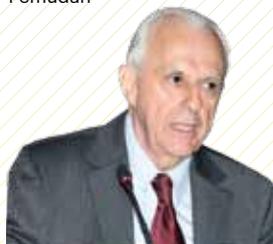
"The National Science Act is nearly completed and the National Policy on STI covered Science for Industry, Science for Wellbeing, and Science for Governance."

Y.Bhg Prof. Datin Paduka Dr. Khatijah Mohd Yusoff
Deputy Vice Chancellor (Academic and International Affairs), Universiti Putra Malaysia

"The ultimate objective of all these policies and all these incentives is actually for the private sector. This close collaboration is important because the industry would have to commercialized all the research that have been done by the universities."

YBhg. Datuk Dr. Rahamat Bivi Yusoff
Director General, Economic Planning Unit (EPU)

YBhg. Datuk Nicholas Zefferys
Past Governor, AMCHAM/NEAC/ Pemudah



"Enhancing innovation: We found that the most prosperous and successful company in the world is high on innovation and one of the up and coming is Turkey."

"A bottom-up culture needs an ecosystem that thrives, and not trying to guess the winners from a top down. Let us build the infrastructure and let the bottom speculate up."

"Science is not new. The world is facing new challenges. New strategies for science should be formulated and need collaboration across organizations. And science will not succeed if stakeholders do not hold up to science."

Dr. Ahmad Ibrahim
CEO, Academy of Science Malaysia (ASM)

"... define the OUTCOME by translating it to MONEY and LIFESTYLE."

"We need a Malaysian very own Innovative Index."

Amerul Muner Bin Mohammad
Executive Vice-President, Agensi Inovasi Malaysia

"S&T committee should work together closely, not in silo to show we are serious in driving the S&T. Let us use S2A as the platform to translating Science to Action by aligning current and existing S&T programmes Nationally."

Dr. Mohd Yusoff Sulaiman
President & CEO, MIGHT

"Culture of innovation goes with entrepreneurship in universities and involvement of 'organisational entrepreneurs'; creative leadership.

"The entrepreneurship is more than doing business. It includes the processes and technology.

"Researcher in universities should come up with knowledge benefitting the communities – encourage research in universities using incentives to gain valuable output. We should work together to create value from our technology, share resources and facilities across the border."

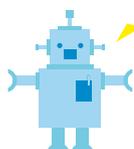
YBhg. Prof Tan Sri Dato' Seri Dr. Sharifah Hapsah Syed Hasan Shahabudin
Vice Chancellor of National University of Malaysia



Top: Let's see how it works. 9, 10 ...bzzzt! SMK Taman Melati demonstrating the electric maze

Left: A group of student from Kuen Cheng High School watching the Robot NAO doing the chicken dance

ENGINEERING AND SCIENCE IS FUN!



Kuala Lumpur Engineering Science Fair (KLESF): An Initiative Under Science to Action (S2A) Promoting STEM Education

“Make Learning Of Science And Mathematics Fun,” says Dato’ Sri Mohd Najib bin Tun Abdul Razak , the Prime Minister of Malaysia who is the number one champion of Science, Technology, Engineering and Mathematics (STEM) education.

During the second Global Science and Innovation Advisory Council (GSIAC) meeting attended by global thought leader in 2012, the commitment to develop the Science, Technology, Engineering and Mathematics (STEM) education was cemented through the introduction of a number of new initiatives. A program called Cradle-to-Career (C2C) based on successful curriculum in the US was installed, which brought science education expert from US Academy of Science to share her expertise throughout Malaysia. A concerted effort on developing excellence in STEM education was further catalysed with the signing of five MOUs between Malaysia’s Research Universities and their US counterparts.

A pioneering program to develop budding scientist named “The Nobel Mindset” was rolled out under the Permata Pintar program, where about 120 selected students and teachers are undergoing continuous training modules under the purview of resident Nobel Laureates at the New York Academy of Sciences. Universiti Kebangsaan Malaysia (UKM), one of the signatories of the MOU with the New York

Academy of Sciences (NYAS) on promoting STEM education has recently showcased its involvement efforts in this subject matter.

During the GSIAC 2013 discussion, the Prime Minister mooted the idea of creating a comprehensive platform to mainstream science, technology and innovation as the catalyst for Malaysia’s future growth, which culminated in the launching of the Science to Action (S2A) in November 2013. The S2A is led by Professor Emeritus Dato’ Sri Dr Zakri Abdul Hamid, the Science Advisor to the Prime Minister and supported by Malaysian Industry-Government Group for High Technology (MIGHT). The STEM education became a critical part of the S2A under the “Science for Well Being” pillar.

As a public-private consultative platform that champions the involvement of industries in building Malaysia’s future, MIGHT has been actively involved in instilling interest for STEM education among students through joint efforts between its human capital development arm, MIGHT-METEOR and industry players such as RAFALE, SNECMA and SAFFREN.

In its latest effort to promote STEM education, the first Kuala Lumpur Engineering Science Fair (KLESF) will be held on 25th – 27th April 2014, at the Pusat Sains Negara; organised by MIGHT and Universiti Tunku Abdul Razak

(UTAR) along with the Asean Academy of Engineering & Technology (AAET), Institute Engineers Malaysia (IEM), MOSTI’s Pusat Sains Negara. It is an S2A initiative supported by key industry players that include UEM, Muhibbah Engineering, Dreamedge and Freescale.

The event was launched by Dato’ Seri Idris Jusoh, the Second Education Minister recently. The KLESF is an interactive event which provides many activities for students. This includes a program whereby students would be able to interact directly with engineers and scientists continuously via its mentoring programme. Seven schools have been identified in this first phase programme. The programme may be expanded in the near future to benefit more than 800 schools throughout the country with the involvement of the Ministry of Education, IEM and the industry players.

Interestingly, the first KLESF has successfully attracted participants from beyond our shore, namely from China and Taiwan. We hope the future KLESF will attract more regional participation from ASEAN countries such as Thailand, Indonesia and many others. This will surely adds more fun and new perspectives to the event.

This is indeed an interesting time for science and technology. As a society, including in our roles as parents and public, we need to change our educational paradigm and instil the passion for science and technology among the students. Science will be the pillar for the country’s development so we need to understand science and keep abreast with new technologies, and perhaps unimaginable technologies!

So come join the KLESF this 25-27th April 2014, and have fun exploring what STEM has in store for you!



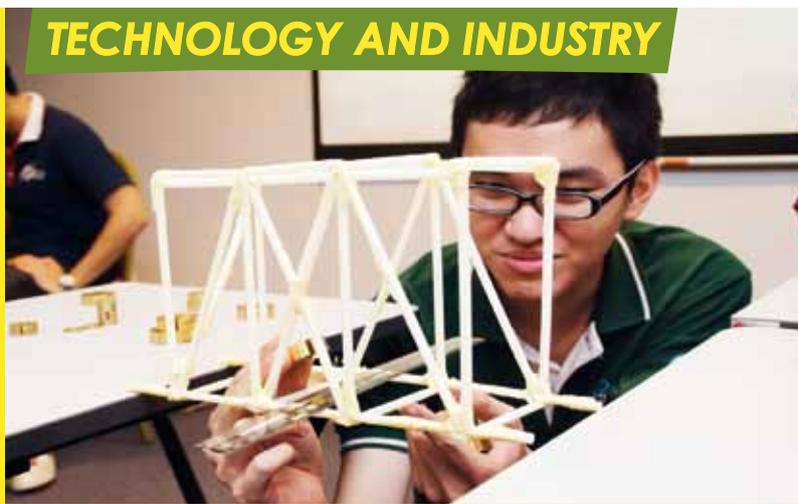
Kuala Lumpur
ENGINEERING
 science
 fair

■ **VENUE**
 PUSAT SAINS NEGARA,
 KUALA LUMPUR

■ **DATE**
 25 - 27 APRIL 2014

■ **TIME**
 9am - 5pm

FREE ADMISSION



For school and Family Day Trip



Contact:
 Tel: 0111-888-9397 / (603) 7958 2628 Ext: 8206/7130, Fax: (603) 7955 8209
 Url: www.klengsc.net Email: info@klengsc.net

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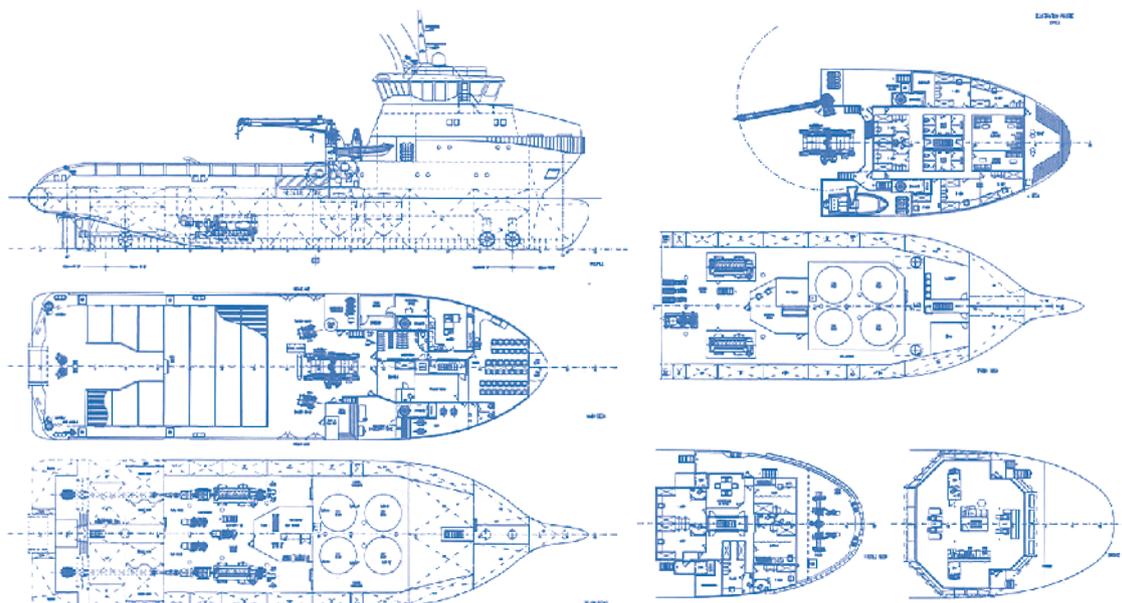
An initiative under



Ship Designing as the Catalyst to the SBSR Industry



by
**SRI WIDIAS TUTI ASNAM
RAJO INTAN**
sriwidiyas@might.org.my



Ship Design in Malaysia

The Malaysian Shipbuilding / Ship Repair Industry Strategic Plan 2020 (SBSR 2020) that was launched in 2011 by the Prime Minister of Malaysia have underlined seven key strategies to spur the development of SBSR industry. Among the strategies is 'Applying local design and adopting new shipbuilding / repair technologies' accompanied with seven actions item that need to be undertaken.



At present, Malaysia has sufficient number of ship designers that are involved directly or indirectly with the SBSR industry. Some of them – United Ship Design, AP Marine, Maritime Technical Centre, and Naval

Arch also cater for the services in Oil and Gas (O&G) industry. They are capable in designing non-complex vessel/ship such as fast crew boat, fishing boat, tugs and barges. The Marine Department of Malaysia has shown confidence in local ship designers by commissioning one of them to design the department's buoy tender vessel in 2002.

The process of ship designing includes initial design, basic design, detailed/production design that involves basic and applied research, design development, design evaluation and calculations at all stages. It also involves the formulation of safety regulations, damage control rules, approval and certification of the ship designs that meet the statutory and non-statutory requirements. Currently, most of the ship designs in Malaysia are imported from other countries, mostly from Singapore.

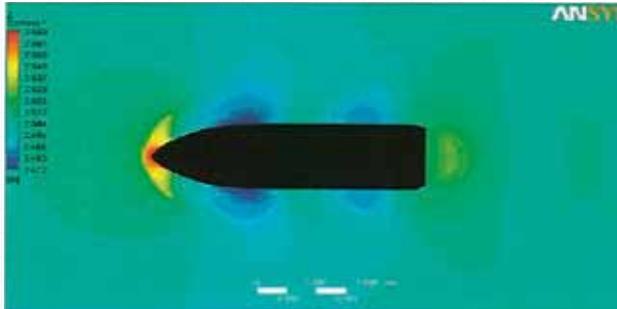
Although Malaysia's SBSR industry started in 1970s, at almost at the same time with South Korea's, we are far behind in terms of ship designing. Korea has extensive experience in the design of various classes of vessels, ranging from small size vessels for government agencies' special purposes to typical commercial vessels such as oil tankers, product tankers, chemical tankers, container carriers, bulk carriers, roll-on/roll-off/multi-purpose vessels, cement carriers, passenger/car ferries, etc. Korea has adopted efficient, high and environmental friendly technology, and built extensive support industry that contributes to the development of its maritime industry.

Trend of Design

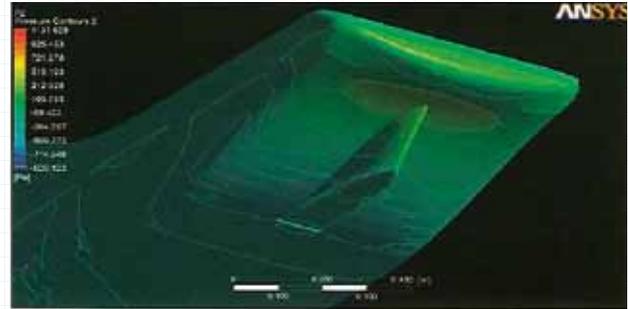
The trend in ship designing is focused on ships that are energy efficient, thus reduces operating cost and minimize gas emission. The International

insights & viewpoints

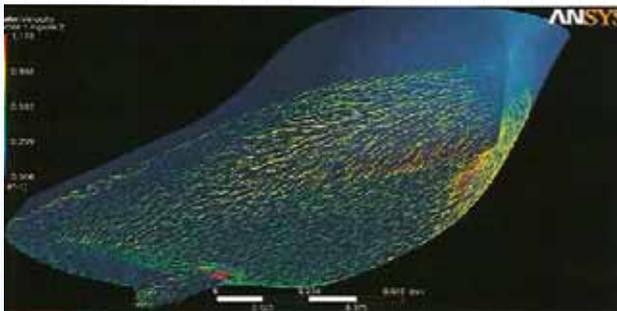
CFD Analysis on Initial Hull Form



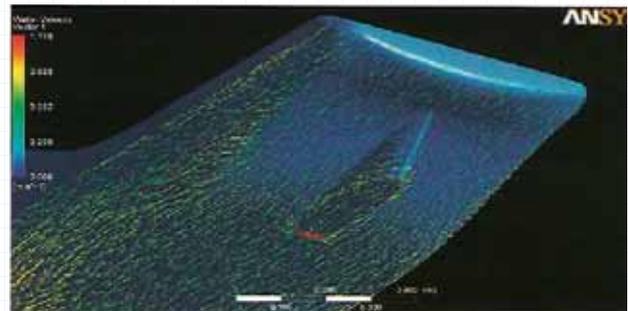
Wave Contour



Bow Pressure Contour



Bow Velocity Contour



Stern Velocity Contour

Basic Design

- General arrangement
- Visualisations / Presentations
- Vessel Specification
- Cost / Benefit assessments
- Hull form design
- Tank plan & Capacity
- Intact and damage stability
- Vessel performance
 - Motions & operability
 - Position keeping
 - Manoeuvring
 - Resistance / propulsion
 - Vessel operation simulation

- STRUCTURE**
 - Structural design
 - Main structural analysis
 - Main scantling drawings
 - Deck layouts
- MACHINERY**
 - System Drawings (P&IDs)
 - Related calculations
 - Machinery layouts
- ELECTRICAL**
 - System diagrams
 - Related calculations
 - Layouts of control room, wheelhouse etc



Detailed Design

- STRUCTURE**
 - Detailed hull design
 - Parts
 - Brackets
 - End cuts, etc
 - Outfitting
 - Deck arrangements
 - Foundations
 - Ladders, etc
 - Accommodation
 - Insulation
 - Panels
 - Ceiling, etc.
- MACHINERY**
 - Equipment arrangements
 - Piping arrangements
- ELECTRICAL**
 - Equipment arrangements
 - Cable arrangements

Production Details

- STRUCTURE**
 - Production information
 - Shrinkage & excess
 - Welding & bevels
 - Etc.
 - Nesting
 - N/C information
 - Templates
 - Panel line information
 - Parts lists
 - Cutting sketches
- MACHINERY**
 - Isometric drawings
 - Cutting information
 - Bending information
 - Spool information
 - Material lists
- ELECTRICAL**
 - Material lists

Quotation documentation

Performance documentation

Main class drawings

Workshop drawings

Production information



Maritime Organization (IMO), through various conventions such as MARPOL, London Convention and Hong Kong Convention introduced regulations to tackle and reduce pollution from ships. The conventions issued guidelines, requirements and standards that need to be complied in order to produce reliable, safe and environmental friendly ship.

One notable regulation introduced through the conventions is that ships dealing in international trade must have ballast water treatment systems, installed by end of this decade. The need for this regulation was emphasized at the IMO Ballast water convention as there have been many cases of alien species being introduced into new environments, with ballast water being a major transfer mechanism in the world today. Organisms carried away with ballast water can establish themselves in new environments causing dramatic shifts in natural ecosystem, disease outbreaks and indigenous species extinction.

The latest trend in ship designing is towards having modern and zero emission vessels. These vessels are to rely on wind, sun and wave energy; and extract hydrogen from water to run itself and not releasing any emissions into the environment. The highly advanced design of the ship called Orcele is said to provide optimum cargo space to transport cars and goods around the world. The subsequent electricity generated can also be used immediately or stored for times of no wind, sun or waves. The only byproduct of this vessel is heat and water. The conceptualized idea by Wallenius Wilhelmsen Logistics is slated to be launched in the next 10 years.

Malaysian Opportunities

Ship designing is the catalyst to develop the Malaysian maritime industry as design is a vital element to maximize the incorporation of Malaysian elements or 'local content' to the vessels built locally. 'Local content' requires the development of our own indigenous capabilities using locally processed and produced raw material, equipment, system integration; and application of our own technological expertise for the design, integration, fabrication, maintenance repair and overhaul (MRO), modification and upgrade.

Boustead Heavy Industries Corporation Berhad, (BHIC) has taken up the challenge by embarking on an Entry Point Project (EPP) under 'Developing Malaysian as Shipbuilding and Ship Repair Hub'. One of the activities is to develop the local design of the Offshore Support Vessel (OSV). The OSVs are to be built by local shipyards to service the Malaysian O&G industry.

The development of local design capabilities by BHIC will be carried

out in phases. This includes the formation of collaboration and strategic partnership with local design companies and academia, and engagement with stakeholders to understand the specific requirement of the O&G industry players like OSV owners, Production Sharing Contracts (PSCs) and Petronas.

Based on the projection of O&G industry under the Entry Point Project (EPP) of National Key Economic Area (NKEA), the demand for OSV is expected to reach up to 200 vessels in the next five (5) years. If this requirement is fulfilled by the local shipbuilders, it is estimated that RM12 billion worth of business will be benefited by the local shipyards and other maritime supported services. This will also create more than 9000 jobs in various disciplines, especially high income jobs such as naval architects, specialised and skilled workers.

The projects are expected to produce medium and long benefits for the industry players and stakeholders such as the opportunity for small and medium enterprises (SMEs) with better exposure to produce, realign or readjust their products to meet certain marine standards. Increased SBSR activities would create business opportunities especially in the manufacturing of marine equipment and components. The availability of local design data would enable future upgrading and modification to be carried out locally. This would, in turn, encourage research and development activities and act as a catalyst for innovation in order to generate other design.

Sailing Ahead

The SBSR industry in Malaysia is here to stay and will continually grow in tandem with the recovering global economy. Nonetheless, the stakeholder commitment to the development of local design is vital in term of providing special fund; for example a government funding and / or matching grant together with involvement of industry players, especially OSV operators / owners. Intervention from government is essential to put in their tender requirement of Malaysian design. The spin off to other industries value chain such as shipbuilding, manufacturing equipment and component as well as services sector will be tremendous.

Malaysia hopes to reduce her dependency on foreign sources gradually, with the target of using 50% local content in her ship production within five to ten years. Further reduction on her dependency on foreign products and services is possible on locally design and built vessels. However, for this initiative to be successful, stakeholders must provide opportunity for local innovation by their willingness to accept local design and locally-made equipment.

The initiative of Science to Action (S2A) that was launched recently would go well in boosting the SBSR industry as a part of Science for Industry initiative. The S2A program is the platform to coordinate and intensify the application of science and technology for economic growth by strengthening current industries' competitiveness to stay ahead and increase private sector participation in technology development activities.

The implementation of S2A for industry through Private-Public Partnership (PPP) under BHIC initiative in developing Malaysian OSV design, would be very meaningful beginning to the SBSR industry in Malaysia. The success of PPP initiative in the aerospace industry has proven that government facilitation through fiscal incentives, 60:40 matching model and human capital development is the key success factor for economic growth.

insights & viewpoints

SBSR INDUSTRY

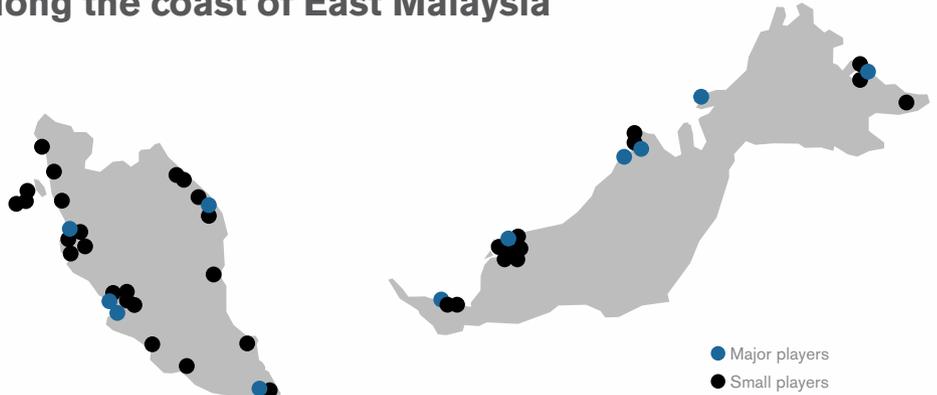
GENERATED
RM 7.34
 BILLION
 IN REVENUE

ATTRACTED
RM 0.42 BILLION
 IN INVESTMENT

SOURCE: MITI

PROVIDED
> 33,000
 JOBS

The **SBSR** industry is well clustered on both sides of the Peninsular as well as along the coast of East Malaysia



NUMBER OF SHIPYARDS		LOCAL SHIPYARD CAPACITY	
PENINSULAR MALAYSIA	EAST MALAYSIA	Range of docking facility	} 500-3,500 DWT
35 PLAYERS	64 PLAYERS	Biggest dry docking	

80 MRO service provider inclusive marine equipment manufacturers throughout the nation

TOP 3
 CATEGORY OF VESSELS BUILT BY MALAYSIAN SHIPYARDS

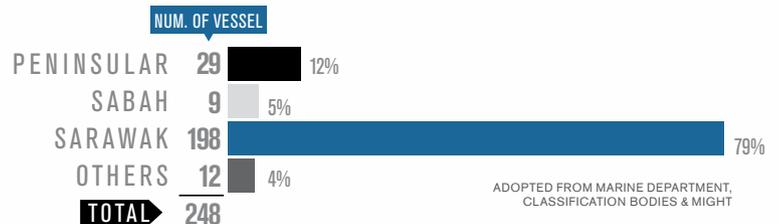


(ADOPTED FROM CLASSIFICATION BODIES & MIGHT)

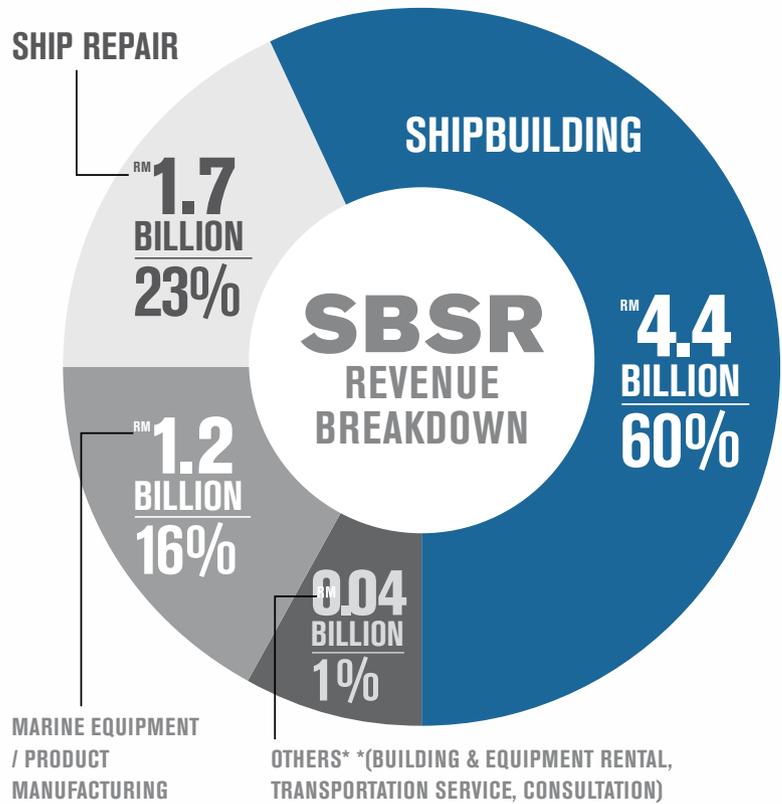
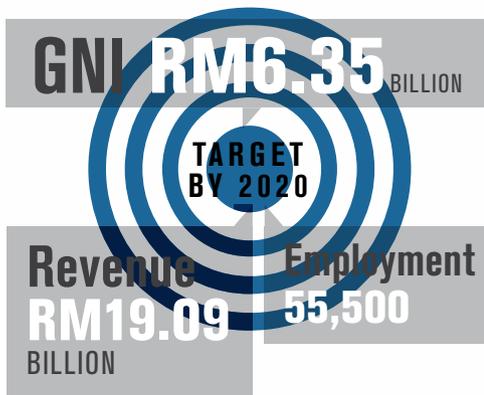
VESSEL PRODUCTION

NUMBER OF NEW BUILDS BY LOCAL YARDS IS RELATIVELY CONSISTENT AT THE AVERAGE OF **280 VESSELS YEARLY**

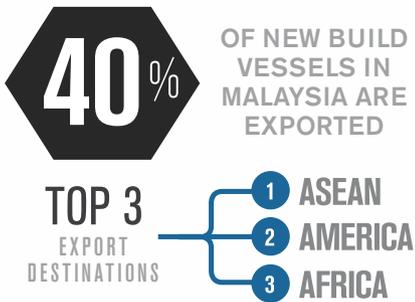
79% of new build vessels in Malaysia are produced in Sarawak



ADOPTED FROM MARINE DEPARTMENT, CLASSIFICATION BODIES & MIGHT



EXPORT



(ADOPTED FROM CLASSIFICATION BODIES & MIGHT)

(SOURCE : MIGHT)

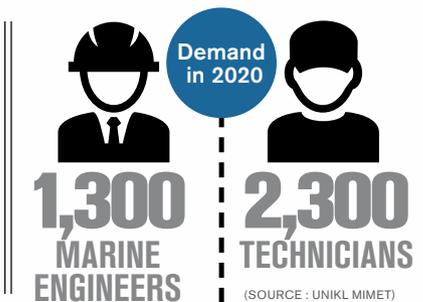
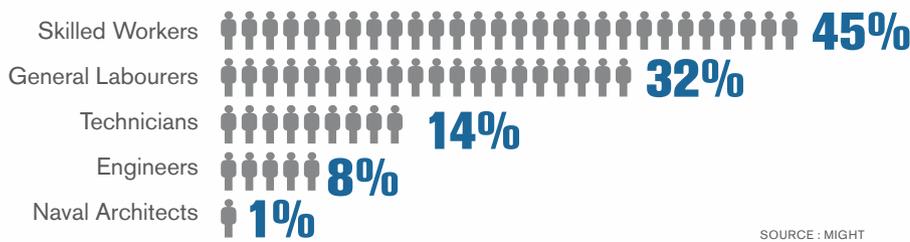
Potential Market

Malaysia has the opportunities to capture the potential market from more than



HUMAN CAPITAL

Shipyard Workforce Breakdown



SOURCE : MIGHT

(SOURCE : UNIKL MIMET)

insights & viewpoints

The Effect of Climate Change on Various Sectors: Policy and Technology as Green Drivers



by
**NORSAM TASLI MOHD
RAZALI**
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The world temperature is rising, rainy and dry seasons have become unpredictable, and wind and rainfall patterns are shifting. These changes – termed globally as climate change – are affecting the ecosystem and lives of all living things. Apart from natural disasters such as hurricane, flood, draught etc. that cause the loss of lives and destruction of properties, the continuous climate change will have negative affect on the economic development of the nation.

Impact of Climate Change

Climate change is a global issue. It does not happen naturally or suddenly, but as a result of human actions and activities such as industrialisation, deforestations and pollution. These activities increase the amount of CO₂, which rises the world temperature (global warming). The increased of greenhouse gases (GHG) due to the burning of fossil fuel and the consistent trend in glaciers changes are the key indicators for climate change.

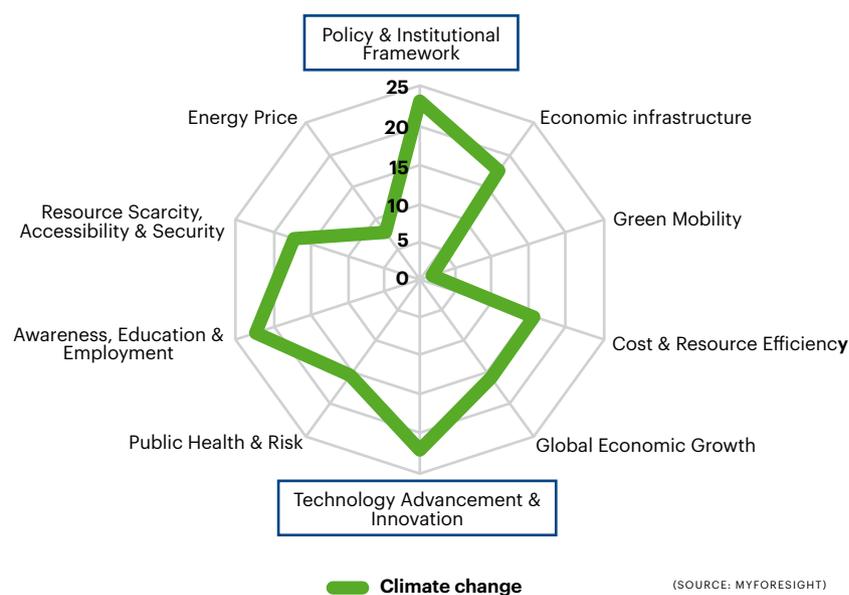
The major threats from climate change are food and fresh water shortage. Natural catastrophes such as hurricane, drought and wildfire have caused development of deserts at many places, rendering them unsuitable for crop cultivation, and extreme flood due to the rise of sea level has inhibited agriculture activities. The melting of glaziers caused by global warming increases the sea level. Water from the sea flows in inland, to fresh water catchment areas, and makes the fresh water acidic. The acidifying of fresh water will harm not only human but also led to extinction of species due to the change of ecosystem.

The Malaysian Scenario

In Malaysia, we have learnt to accept the fact that annually we would be facing a season of heavy rain that causes massive losses of live and property. Malaysia has experienced losses of approximately RM185 million (USD60 million) per year with 1239 total average number of people killed in 58 events of natural disasters. However, steps are being taken to mitigate the effect and minimize the damage.

The target is clear. First, the government has pledged a 40% cut of emissions intensity by 2020 (from the level of emissions intensity in 2005) to ensure our economic growth is compatible with a stable climate. Second, the government has formulated a policy to ensure that 50% of Malaysia remains as permanent

Influence of Climate Change to Green Drivers



forest in order to protect the value of Malaysia biodiversity.

In many sectors, greener approaches are implemented to mitigate climate change. Various policies are formulated and programmes implemented for technology advancement and to increase public awareness. The main thrust of these policies and programmes is to minimise the damages or deal with the effects of climate change. Opportunities from and threat of climate change are gauged for the development programmes to diminish the negative impact and create activities, especially in the economic sectors.

Climate Change and the Energy Sector

The energy sector, particularly the use of fossil fuel, is one of the main contributors to

climate change, especially on the way energy is produced, delivered and consumed. But energy is indispensable as it is an essential part of the economy. It plays an important role in other economic sectors such as transportation, building and manufacturing. Therefore, a 'healthier' way of producing, delivery and consumption of energy should be explored and practised.

Policy & Economic Infrastructure

Energy sector has been the backbone of Malaysia's economic growth as it contributed approximately 20% of the national GDP. The target is to raise the energy sector's total GNI contribution to RM241 billion by 2020, from RM110 billion in 2009. In order to achieve this target, the government has formulated a strategic policy and implemented various plans to provide a 'healthy' and sustainable energy platform.

insights & viewpoints

In 2009, the government, through the Ministry of Energy, Green Technology and Water (KeTHHA), introduced National Green Technology Policy. One of the objectives of this policy is to reduce the rate of energy usage and enhance the development of sustainable growth of the energy sector. KeTHHA is responsible on all issues related to national electricity supply, whilst energy policy for the upstream sector such as Oil and Gas is determined by the Economic Planning Unit (EPU) and the Implementation and Coordination Unit (ICU).

The efforts for Green Technology started long before National Green Technology Policy was introduced. Since 1995 and up to 2010, the Ministry of Science and Technology (MOSTI) provided funding for 286 green technology projects with an amount of approximately RM213 million. As an effort to encourage industry participation and involvement, Feed in tariff (FIT) is implemented. It allows users to generate power from alternative energy resources such as through Solar PV, Biomass/ Biogas and Small Hydro. Energy generated from these resources can be sold back to the national grid at a higher rate. Specific contract time frame is established – 16 years for Biogas and 21 years for Solar PV and Small Hydropower.

Technology for Efficiencies

The emphasis is energy efficiency. The utilisation of alternative and renewable energy has become the key area in the energy sector. Technologies such as clean coal, carbon sequestration and co-generation are targeted in the effort to reduce contribution of energy sector to GHG emission especially Carbon dioxide (CO₂) during power generation. Decentralised energy system such as smart grid has been introduced as an improvement to energy transmission and distribution. Through this approach, 10% of energy lost could be saved and utilised. Energy storage technology such as fuel cell, ultra critical capacitor and flywheel is introduced and may be implemented in future.

Climate Change and the Transport Sector

The contribution of Transport Sector to Climate Change

Transportation is known to be the highest CO₂ contributor, responsible for 13% of global GHG emission.

Urbanisation and globalisation of trade intensifies GHG emission. Urbanisation leads to higher need of public transportation and ownership of private motorised vehicles,



whilst globalisation increases trade activities utilising various mode of transportation – land, sea and air. All type of motorised vehicles – private, public and commercial – emit large amount of GHG and pollute the atmosphere. It is estimated that between 2010 to 2050, a significant increase of emissions are projected for road freight, aviation and maritime at more than 45%, 50% and 65%, respectively if there is no action done to mitigate the problem.

Government's role

The effort to control GHG emission requires the participation of all level of society – government, industry players and the general public. The government could formulate policy, promote public awareness, and enforce law and regulation.

Improving the efficiency of public transport in major cities would be able to reduce the utilization of private vehicles, thus reduce GHG emission. A study by U.S. Department of Transportation indicated that public transportation produces significantly less GHG per passenger mile than private vehicles. From the study, heavy rail transit such as subways

produce about 75% less in GHG per passenger mile than an average single-occupancy vehicle (SOV). While, light rail systems and bus transit produce 57% and 32% less emission, respectively.

Reducing the price of green diesel could be another step towards reducing GHG emission. It would encourage more people to use green diesel powered vehicle. Stringent and regular check of commercial/public vehicles and imposition of heavier penalties would help too as it would force owners/operators to regularly serviced and maintained the engine of their vehicles.

Through the 'green initiatives', the government encourages the public to switch to greener option. For examples, in Budget 2011 the government has announced 100% import and excise duties exemption for hybrid and electric cars. This incentive was extended to 31st December 2013 in budget 2012 to. As a result, more hybrid models are seen on Malaysian roads today.

Technology Development

The transport sector is always being accused to be the main cause of pollution and resource depletion. Fossil fuel that is being used by almost all mode of motorised transport is the main contributor. This prompted the search for new source of energy. Research and development of new fuel from renewable resources such as biofuel has been encouraged.

Malaysia has embarked in biofuel technology since 1982 and has successfully created a type of fuel that is suitable for land and sea transport. The fuel is a mixture, consisting 5% palm oil and 95% diesel. The research and development is an on-going process with mass production and commercialisation being the ultimate aim.

Globally greener private vehicle is being developed by almost every automobile producer. Hybrid and electric vehicle are the examples of the technology where the vehicle will ensure better fuel economy and, most importantly, lower GHG emission.

Climate Change and the Building Sector

Building sector contributes to one third of global GHG emission through the consumption of energy. It is estimated that buildings consume more than 40% of global energy. Buildings also contribute to other GHG emission, such as halocarbons.

Climate change does not happen naturally or suddenly, but as a result of human actions and activities such as such as industrialisation, deforestations and pollution.

Not everyone is aware about the contribution of the building sector towards climate change. Most industry players in the sector are either ignorant or not bothered. Therefore, it is left for the government to formulate policies, implement awareness programmes, and enact related laws and regulations.

Policies for Sustainable Energy

In Malaysia, the government promotes the application of renewable energy and energy efficiency for the building sectors. The initiative is intended to promote the development of buildings that consume less energy and emit less GHG.

Green Building Index (GBI) is one of the initiatives that have been implemented in Malaysia. GBI targets energy efficiency. Six criteria, including indoor environment quality, sustainable site and management, materials and resources, water efficiency and building innovation, are set to measure energy efficiency. Currently, there are 150 buildings in Malaysia that has been certified with GBI.

Besides GBI, Low Carbon Cities Framework & Assessment System is being introduced to plan for sustainable cities development. The plan covers four aspects of township which are environment, infrastructure, transportation and building. The Green Townships in Putrajaya and Cyberjaya are developed according to this plan.

Sustainable Building Technology

Cost-effective technologies and methodologies are available to be explored and applied to design sustainable building. Technology such as Building-integrated photovoltaics (BIPV), Rainwater Harvesting (RWH), Regenerative Lifts, Energy Recovery Ventilation (ERV) and application of Green ICT in green buildings has been proven to bring efficiency in building operations.

The development of The Energy Commission's Diamond Building in Putrajaya is an example of a building that applies energy efficiency. The building has the ability to reduce carbon dioxide emissions of 1,400 tonnes per year, which is

similar to remove of 700 cars that has travelled 12,000 km from the road. The building has also saved RM1 million annually in operating costs – RM950,000 from energy efficiency and RM45,000 from solar power generation.

Climate Change and the Manufacturing Sector

Manufacturing is responsible for over 20% of global CO₂ emissions, mostly from the energy usage during the production stage. In Malaysia, the manufacturing sector is the biggest final energy user, at 18 667 ktOE of energy, equivalent to 42.6% of total final energy consumption. It accounts for up to 17% of air pollution-related health damage.

Collaboration for Better Policy

The government, in collaboration with the United Nations Development Plan (UNDP), has established a study titled 'National Carbon Disclosure Programme' (NCDP) with the aim to minimise GHG emission from the manufacturing sector. NCDP encourages manufacturing companies to set emission reduction target and develop effective emission reduction action plan. NCDP also formulated a system to gauge the achievement and prepare Malaysia for further carbon emission reductions in the future.

Technology

Climate event plays an important role in the choice of location. Manufacturers would locate their manufacturing facilities in areas that are not prone to flood and storm. Other considerations include the availability of infrastructure such as power and water supply, transportation facilities and labour supply.

As manufacturing activities are profit driven business ventures, manufacturers find ways and means to save cost. This would spur the effort and investment in technology to improve the energy efficiency. One example is Fonterra Malaysia that has reduced energy usage by reducing air pressure in machinery and replace high-voltage light bulbs with fluorescent bulbs. Hence, technology such as machinery and automation has been proven to reduce

manufacturing effect to environment and, as result, climate change event can be reduced.

Climate change and the Agriculture Sectors

Agriculture practice causes climate change

Globally, the agriculture sector contributes 14% of GHG emission. The contribution to climate change from the agriculture in Malaysia is mostly through methane (CH₄) emission. Most of the CH₄ emissions are the result of continuous flooding of irrigated rice areas. It is estimated that future emissions from rice cultivation will increase slightly due to production intensity and the increase of small new areas of rice cultivation. Fertiliser usage and livestock management also contribute significantly to GHG emissions for this sector.

Climate Change Drawbacks

Climate change that causes unpredictable weather has a negative effect on the agriculture sector. Planting, harvesting and other agricultural activities would be difficult to schedule. Production would decrease. Changes in climate would decrease yields of rice by between 13% and 80%, and production of industrial crops, particularly oil palm, rubber and cocoa would decline by 10-30%.

Malaysia is an agriculture-based nation with at least one third of its population depends on the agriculture sector for their livelihood. About 14% work in farms and plantations. Approximately 39.2% of total land use or about 5.18 million hectares are planted with trees and crops like rubber, oil palm, cocoa, coconut, fruits and vegetables. In spite of this, Malaysian agricultural sector is unable to produce and supply sufficient food for its population. Malaysia has to import rice, fruits and vegetables from other countries. The negative effect of climate change on the agricultural sector would force Malaysia to import more.

Policy to Green Agriculture

Malaysia has formulated green agriculture practises to minimise her dependant on imported agricultural products. Its implementation would increase farm

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productivity and, at the same time, improve the quality of environment.

The enforcement of green agriculture practises by government would create awareness among the industry players to practise sustainable approach. At the same time, it educates the citizens to accept and consume green products. The introduction of Aquaculture Farm Certification Scheme (SPLAM) and Certification Schemes for Good Agricultural Practice (SALM) and Good Animal Husbandry Practice (SAL) would encourage good agriculture practice.

Technology & sustainable practices

Technology is one of the tools to make green agriculture possible. Technology encourages efficiency of resource usage. It also enables the agriculture sector to limit its GHG emission. Technologies such as aqua-ponic, bio-organic fertilizers and bio-control minimises the GHG emission. Technology also enables practises like organic farming, natural farming, crop rotation and inter-cropping to improve quality and quantity of agriculture products.

Proper set up of water control infrastructures and good water management, especially in the main greenary areas, is estimated to reduce 30% of GHG emissions by 2015 from rice cultivation area as compared to conventional practices.

The use of alternative natural sources of nitrogen, especially bio-fertilisers or soil microbes, can reduce N₂O emissions up to 5 to 10%. And, in the long term, it can also increase the carbon sequestered in soil which increases the soil organic matter.

Climate Change and the Forestry Sector

Forestry sector is an essential natural resource to Malaysia. It contributes significantly towards the country's economy and environmental well-being. Forestry sector has contributed to the economic development by providing timber resources for the wood-based industry. In 2008, the wood-based sector earned RM22.5 billion and is predicted to expand to RM53 billion by 2020.

The effects of Climate Change

Climate change would have negative impact to forestry sector, especially in timber supply, and halt economic development. Climate change increases the possibility of forest fires, insect outbreaks, wind damage, and other extreme incidents. It would cause the forest to lose its ecotourism aesthetic and recreational values, and reduce biodiversity and non-timber forest products.

Currently, Malaysia is covered by 18.48 million hectares of forest, which is 56% of her land area. Forests are known to act as CO₂ sinks where carbons are being absorbed by plant from atmosphere as they grow and store some of the carbon throughout their lifetime.

Policy and Institutional Framework

Forestry in Malaysia comes under the jurisdiction of the respective state government that enacts laws and formulates forestry policy independently. The federal government assists by providing advice and technical assistance such as training, research and maintenance of experimental and demonstration stations. The cooperation between state and federal government is through the establishment of National Land Council to discuss and resolve common problems and issues relating to forestry policy, administration and management, as well as to ensure a coordinated approach in the implementation of policies and programs related to forestry.

The National Forestry Policy, 1978 (Revised 1992) and National Forestry Act, 1984 (Amended 1993) has been in place to encourage sustainable forest management with the objectives to conserve and manage the nation's forest based on the principles of sustainable management. The National Forestry Policy was formulated and the National Forestry Act was enacted to protect the environment, biological diversity, genetic resources, and enhance research and education.

Since forestry contributes 17.4% of CO₂ to global environment, mitigation for reducing greenhouse gas emission by forestry sector is required. Malaysia has taken this challenge by improving the sustainable forest management

with the implementation of Reducing Emissions from Deforestation and Forest Degradation (REDD). Forest management practice in supportive of REDD+ is conducted with four main targets – (i) avoid deforestation through gazetted new Permanent Reserved Forests (PRF) and Central Forest Spine, (ii) implementing Forest Management Certification (MC&I), (iii) Conservation of forest by identifying forest functional classes and mitigation measures during forest operation and (iv) enhancement of carbon stocks through enrichment planting, planting along skid trails, planting on log yards and 26 Million Trees Planting Campaign.

Climate Change and the ICT Sector

Information and communication technology (ICT) sector contributes 2% to 3% of CO₂ emission. The emission is contributed both directly, that is ICT itself affecting to environment, and indirectly when the ICT acts as a tool for other activities. ICT sector is the fifth largest sector in global power consumption which is 8% to 9 % of the total consumption, and the value is expected to grow by 20% a year. In 2030, it is estimated that the world energy consumption will double because of the usage of ICT. In Malaysia, it is estimated that the government has spent RM120,000,000 on electricity for ICT operation. The negative part is, the ICT sector had generated 270,000 metric tons of CO₂ emission to Malaysia's environment.

Direct GHG emission of ICT is in Data Centre operation where the electricity usage is the largest contributor to direct environmental impact. Data Centre requires high electricity consumption to perform and, as a result, heat is being produced as a by-product. Large amount of energy is required to remove the heat from the facility. Therefore, improved Data Centre electricity and heat management are the most significant ways to reduce the negative impact on the environment.

Green ICT

Information and communications technology (ICT) is always known as the enabler for other sectors improvement. Green ICT is a prospect in the effort to establish, stabilise and sustain a

Natural catastrophes such as hurricane, drought and wildfire have caused development of deserts at many places, rendering them unsuitable for crop cultivation.

greener environment. By integrating ICT with green goals, greener environment to various sectors and industries could be achieved by indirectly reducing their ecological footprint.

Technology

As mentioned earlier, ICT sector is a sectors-enabler where greener environment can be achieved through “off ICT” (the development in ICT itself), and “by ICT” (the use of ICT as a tool). Generic ICT parts, components, equipment, green datacenter and cloud computing are the examples of “off ICT”, while “by ICT” encompasses e-Services such as e-Banking and e-Government, Unified Communications (virtual meeting), Green ICT Practices and Other Green ICT Applications.

An example of green “off ICT” technology in Malaysia is the KeTTHA Green Data Centre where energy management has been improved and established. The KeTTHA data centre qualifies as “Green Computing Facility” due to its efficiency on power management. KeTTHA Green Data Centre (GDC) has complied with the standards set by Leadership in Energy and Environmental Design (LEED) where the measurement of Power Usage Effectiveness (PUE) is 1.6. Other public data centres PUE readings are around 3.0 to 4.0. GDC KeTTHA has been awarded the platinum certificate by the Green Computing Initiatives (GCI) in October 2011.

‘by ICT’ technology is implemented to assist in major operation of other sectors. The best example of “by ICT” is the implementation of the monitoring system as it offers a more accurate forecast. The system has been used effectively in global climate change monitoring and water resource management. Water resource management covers elements such as mapping of water resources and weather forecasting.

Another example of “by ICT” is dematerialization approach targeted to meet the changes in citizen lifestyle through technology such as media online, e-commerce, e-billing and telecommuting.

Policy towards Green ICT

Malaysia is serious in her effort to become a green nation and the focus on Green ICT can be seen through her regulatory framework. Incentivize approach is applied as an encouragement to practice green ICT. Incentives are given for the adoption of green practices in all federal and state government offices, use of energy efficient products at data centers and the use of 3R (reduce, reuse and



recycle) by ICT companies. Green procurement policy and reviewing existing regulatory framework to legalize e-Document in court of Law has been established to promote green ICT.

Tax incentives are provided for green ICT users, while green ICT providers are given investment tax allowance. Financial assistance has been offered to companies that are willing to adopt green.

To penetrate international market and product promotion, the government encourages local entrepreneurs to choose green data centre services, conduct workshops and seminars on green ICT practices for targeted enterprises and consumers, and conduct road shows abroad to promote Malaysia as a shared service centre for teleworking services.

Climate Change and the Water Sector

The effect of Climate Change

It cannot be denied that extreme climate incidents almost always have major impacts on the water sector, especially water resources. The nature of these impacts is wide ranging

and varied, including floods, droughts, saline intrusion and the loss of glaciers. And every one of these impacts invariably affects the fresh water supply to homes, agriculture and industry.

The IPCC report predicted that fresh water resources will decrease by 10 – 30% as a result of climate change. The report also projected that in 2080s more places will be flooded annually due to rise of sea level.

Malaysia has experienced high rainfall that leads to flood and causes failures of water control structures such as dams, barrages and bunds. Heavy rainfall increases the frequency of soil saturation and severe landslides. It accelerates soil erosion and causes soil degradation, scouring of drainage structures and sedimentation in rivers and reservoirs.

Policy and Water supply

Rain is the main source of water supply for Malaysia. Malaysia receives about 990 billion m³ of rain annually. Rivers and reservoirs supply 97% of the nation’s water demands, and forests play an important role as water catchment areas.

In order to ensure adequate and stable supply, Malaysia has taken serious action towards water management where action for implementation has been in place in 10th Malaysia Plan (RMK 10) and National Physical Plan (NPP). The implementation of the Integrated River Basin Management (IRBM) plan which includes integrated management of water resources, land resources, ecosystems and socio-economic needs would enable a more comprehensive approach towards reducing the vulnerability to climate change. Laws like the National Water Services Commission Act, 2006 (NWSC Act) and the Water Services Industry Act 2006 (WSI Act) are in place to promote sustainable water use and better water management which are crucial in adapting to climate change.

Integrated Water Resources Management (IWRM) plans and their implementations have strengthened Malaysia’s ability to deal with floods and droughts. RMK10 and NPP have prioritised the restoration of rivers and waterfronts in cities, and flood mitigation plans and strategies.

Technology Adaptation

Information sharing and networking has improved, especially with greater application of ICT. National Hydraulic Research Institute of Malaysia (NAHRIM) has established the National Hydraulic Data Repository to store

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water related issues in digital format and make it more accessible, usable and exploitable. Through this, information regarding water issues including digital copies of tables, figures, charts and chapters from key water-related study are available and accessible.

Technology also has been applied for infrastructure improvements such as in the 'Storm Water Management and Road Tunnel' (SMART) which helps to address urban flooding in Kuala Lumpur city, and the structural upgrade of Timah Tasoh Dam in the state of Perlis to increase storage capacity to alleviate water shortages.

Climate Change and the Waste Sector

Domestic and commercial wastewater treatment and industrial wastewater treatment processes contribute to greenhouse gas (GHG) emission. In waste sectors the main GHG produced is methane gas (CH₄) which is derived from the landfill. While, other GHG such as nitrous oxide N₂O derives from wastewater and CO₂ from incineration of wastes that contain carbon.

Policy for Better Waste Management

In Malaysia, solid waste management is under the jurisdiction of Ministry of Urban Wellbeing, Housing and Local Government.

The amount of solid produced by Malaysian is alarming – 33,000 tonnes per day. This prompted the government to formulate the first comprehensive policy on waste management, the National Strategic Plan for Solid Waste Management, in 2005 (NSP 2005). The NSP 2005 proposes the formation of an integrated municipal solid waste management hierarchy that prioritizes waste reduction through 3R's (reduce, reuse, and recycle).

Then, Solid Waste and Public Cleansing Management Act 2007 (Act 672) was enacted to empower the Director General of the Department of National Solid Waste Management to directly control solid waste management. A fine not exceeding RM1000 will be imposed on any person who is found guilty of contravening any section stipulated in the act, and manufacturers are compelled to take back their products or goods if they are found to be illegal under this act. Three concessionaries – Alam Flora Sdn. Bhd., Environment Idaman Sdn. Bhd. and SWM Environment Sdn. Bhd. – are appointed to manage solid waste in Peninsular Malaysia under this Act.

Technology

There are several ways to reduce GHG emissions from waste products. One: Minimise the amount of waste. But this would be difficult as urbanisation and increase population would definitely increase the amount of waste. Two: To divert the waste from entering landfill via option through recycling, thermal treatment and changing waste composition. Three: Via thermal treatment through incineration, gasification and pyrolysis technology.

In 10th Malaysia plan, the government has detailed the measures to reduce GHG by boosting the efficiency of solid waste management through building of materials recovery facilities and thermal treatment plants as well as recycling of non-organic waste.

Recycling is the lowest cost option in waste management. A study conducted by the Ministry of Urban Wellbeing, Housing and Local Government in 2012 showed an increasing trend for recycling amongst Malaysian household, from 5% in 2005 to 9.5 % in 2012. However this is considered low as compared to the daily production of waste.

Thermal treatment – incineration, gasification and pyrolysis is costly but the most effective to reduce GHG emission. The government has planned to build three thermal large scale incinerators located at Taman Beringin, Kuala Lumpur; Bukit Payung, Johor; and Sungai Udang, Melaka.

Apart from reducing GHG emission, through the use of technology such as incineration (that can improve the sanitary landfill and reduce up to 75% GHG emission) energy can be recovered and generated. One of the incinerators, to be built in Kuala Lumpur, is targeted to generate electricity.

In the second national communication to United Nations Framework Convention on Climate Change, the Malaysian government has estimated that by increasing the recycling rate from 5% to 22%, and by having more material recovery facilities and building more sanitary landfills, Malaysia would be able to reduce GHG emission from the waste sector by 25.5 % in 2020.

Conclusion

Implementation of policies and technologies has been proven to help sectors adapt and mitigate the climate impact. Effective policy brings better coordination, management and collaboration, while technology that improves efficiency creates less pollution. Government policy, correct application of technology, public awareness and education, and social responsibility from all sectors would together develop a greener nation. This is where Science to Action (S2A) is crucial to ensure that everyone is being mobilised towards fulfilling the beyond 2020 aspirations through Science, Technology and Industry.

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Change Management: Perspective and Challenge



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Introduction

Many organizations face with a situation where it requires the management to deal with recurring issues on non-achievement of KPIs, non-performing and demotivated workforce, and serious problems with company's profitability and liquidity. When it happens, some has resorted to look at their strategies to see where it goes wrong and try to maneuver and modify the strategies along the way. If they still fail to address the issues or the solutions fail, they will introduce alternative management tools to the organization like Benchmarking, Balanced Scorecard, Core Competencies, Supply Chain Management and the like. Some might think that it is caused by the inability of the existing workforce and then replace them with new recruits as quick-fix solution to successfully implement their strategies effectively. In some serious case, the management might think that the whole organisation has in-depth issues and would like to totally revamp the whole process. All these efforts, either in part or holistic approach, are part of the Change Management process that is created with simple purpose to turnaround the organisation from a bad state to a desired state.

Change Management Defined

Before we look at the challenges in implementing the changes, we should look at and try to understand the definition of Change Management. There are many definitions provided by the management gurus. Among them include the following:

"The process, tools and techniques to manage the people-side of business change to achieve the required business outcome, and to realize that business change effectively within the social infrastructure of the workplace" (Source: Change Management Learning Center)

"The systematic approach and application of knowledge, tools and resources to deal with change. Change Management means defining and adopting corporate strategies, structures,



procedures and technologies to deal with changes in external conditions and the business environment" (Source: SHRM Glossary of Human Resources Terms)

The understanding of the definition is important to ensure people will not confuse with the changes that they made with other things. Based on study made by *Tim Creasey of Prosci Research*, he explored the definition into two contexts, that is the "change" itself and the "project management" where the former deals with the people impacted by the change while the latter focuses on the **tasks** to achieve the project requirements. Both are of equal importance to bring the organization from a **current state** (how things are done today), through a **transition state** to a **desired future state** (the new processes, systems, organization structures or job roles defined by 'the change').

Harold L. Sirkin, Perry Keenan and Alan Jackson alternatively look at the definition from different perspective by classifying the Change Management into two (2) elements, namely the hard side and the soft side. The hard side of the Change Management includes *time, no of people and financial results*. While the soft side, the most fashionable side of the change, includes *culture, leadership and motivation*. They also

concluded that both factors are of equal importance to ensure any attempt to make changes to the workplace should be applied hand in hand to improve the success rate. They also concluded that a company must pay attention to the hard issues first before the soft elements come into play to avoid a breakdown in the transformation program.

Change Management in perspective

But before we look at the challenge, let us look at the process of the change management. Normally, a change to the organization will ultimately going to impact one or some of the following parts:

- i) Processes
- ii) Systems
- iii) Organization structure
- iv) Job roles

While there are numerous approaches and tools that can be used to improve the organization, all of them ultimately prescribe adjustments to one or some parts of the organization listed above. Change typically results as a reaction to specific problems or opportunities the organization is facing based on internal or external stimuli. While the notion of 'becoming more competitive' or 'becoming closer to the customer' or 'becoming more efficient' can be the motivation to change, at some point these goals must be transformed into the specific impacts on processes, systems, organization structures or job roles. This is the process of defining 'the change'.

There are five key principles that need to be considered as well when planning for a change;

Principle 1: Different people react differently to change – people is either at "stability" or "change" spectrum. People at stability spectrum will not welcome any change to the way things are done. While people at the change spectrum would always look for something new and difference.

Principle 2: Everyone has the fundamental needs that have to be met – control, inclusion and

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openness. If a change program fails to meet the control, inclusion and openness needs of the individuals affected by it then that program is likely to encounter a range of negative reactions, ranging from ambivalence through resistance to outright opposition.

Principle 3: Change involves a loss, and people go through a "loss" curve - The relevance of the "loss curve" to a Change Management program depends on the nature and extent of the loss. If someone is promoted to a more senior position, the 'loss' of the former position is rarely an issue because it has been replaced by something better. But if someone is made redundant with little prospect of getting a new job, there are many losses (income, security, working relationships) that can have a devastating effect.

Principle 4: Expectations need to be managed realistically - The relationship between expectations and reality is very important. If the employees' expectations are not met, they are unhappy. If their expectations are exceeded, they are happy.

Principle 5: Fears have to be dealt with - In times of significant change, rational thought goes out of the window. This means that people often fear the worst. In fact, they fear far more than the worst, because their subconscious minds suddenly become illogical and see irrational consequences.

These principles have to be understood and addressed properly by the Management when considering affecting the change at any parts described above.

While looking at the Change Management from modern perspective, it is also interesting to share how Islam approaches this subject differently. In Islam teaching, Allah (*subhanahu wa ta'ala* – exalted is He) makes specific reference on the requirement to change ourselves first before we make attempts to change the world. Muslims are encouraged to make conscious decision in their heads to either feel helpless or empower ourselves. There is one particular surah which Allah makes special reference to this topic, that is

"...Indeed, Allah will not change the condition of a people until they change what is in themselves..." (Qur'an, Surah 13 Ar R'ad (The Thunder) ayah 11)

Many people believe they can change the world, but forget that changing the world is not simply changing the external. It is also changing yourself. You may have strengths and

weaknesses you need to work on, but you cannot advocate for world peace, justice, kindness, helping others or a better working place when you have not established those ideals in your own life, your own home or your own office.

It would be hypocritical, for example, of a leader who secretly abuses his power in the office taking to the employees of the organisation to advocate for adherence to the rules and governance. What good do his deeds do for him if he is not living up to them? Change would start with himself, then with his family, then with employees in the organization, and then with the community at large.

Internal change is the *sunnah* (way) of the Prophet Muhammad. When he received the message of Islam, he began with those closest to him—his family and close friends. Only after he invited them to Islam did he begin telling the people of his tribe, people in other cities, and eventually the world. The wisdom in this approach is to ensure the purity of your activism and actions for the sake of Allah swt. Ask yourself: are you serving the community to show off or boost your ego, or are you truly doing it for the sake of Allah swt?

That said, you must first change yourself before changing anything else to ensure any Change Management programs that are going to be introduced will be easily adapted to overcome any challenges in the implementation. This shall be the next topic that I will touch on, that is the challenge in the Change management.

Change Management and challenges

Regardless of the approaches used, each has its own merits and has been used extensively by the gurus of the management in driving the big turnaround in one organization. Some with success and some met with failures. Studies show that in most organization, two out of three transformation initiatives fail. The more things change, the more they stay the same. This was mainly due to differences on what factors most influence transformation initiatives as individuals look at an initiative from his/her point of view and personal experience; and there are so many ideas offered by the management gurus which taken together, it will force the company to embark on many priorities simultaneously which in turn spreads resources and skills thin.

Based on a number of researches and articles with regard to change management, the challenge can be commonly grouped into 3 key factors namely **resistance**, **communication** and **process of change**. All this attributes to

human factor.

1. RESISTANCE

They are many reasons why people in an organization resist change. Among them includes the following;

a) Organizational culture

Every organisation has its own culture that is defined by processes, methods, habits, procedures and perceptions that are engrained in the organization and its people. These characteristics are difficult to alter as they are developed over the course of time and become the precedence and standards for the accepted way of doing things within an organisation. Consequently, these expectations and belief systems become established in the working environment and any attempt to adjust or make change to the "normal" way of doing things become strange to people and perceived as of no benefits.

b) Negative influence from within the organisation

Resistance basically comes from the existing employees in the organization and can be in any forms. It includes resisting on the appointment of new leader because there are some employees who feel they are more deserving of the role; minorities who simply do not like change and would try to influence others to do the same; negative persons who will be the first to prove that the change does not bring benefits to the organization; or even old employees who simply feel ill-equipped by the new competencies attached to the new role that makes them look incompetent.

c) Introduction of new element - technology

In some part, changes in technology brings about change in the business process, workflow, control and the exposure of information. People are threatened by new technology because they are often seen as intrusive, redundant and not relevant to an individual's specific job. It introduces new procedures that interfere with the organizational norms, new technologies that create fear of the unknown and new power relationships that upset the hierarchy. The resistant comes from feelings of loss of control, technical inadequacy, uncertainty, surprise, resentment, job loss/replacement, competition and more work for employees.

2. COMMUNICATION

Communication is a crucial element of change management. It entails activities like dealing with people, managing their expectation, and explaining why certain changes are being made. Whatever changes are made, the workforce

needs time to adjust to new processes, procedures and responsibilities. Studies show that few people adapt easily to new situations within the workplace. The uncertainty that comes with changing circumstances often stirs fear in workers who have grown accustomed to doing things in a certain way.

A study made by *Jean Scheid*, listed communication as one of the top Change Management issues as seen in the failure to communicate when a change occurs or is about to occur. If the change is never communicated to employees, we can expect to face anger and resistance from them regardless of how large or small a change may be. Many leaders also forget to inform employees that are in lower positions as they rely on their immediate supervisors to handle company-wide range change. In certain cases, the changes are too swift and done without explaining the reason for the changes.

W Chan Kim and Renee Mauborgne, authors of the book *Blue Ocean Strategy* further reiterated the importance of motivating employees and getting them on board when introducing a change. And this can only be done through clear and well defined communication plan to address the needs of the employees.

A new recent study carried out by Human resource (HR) consultant Towers Watson found that the top-performing companies do use various forms of communication to keep the employees abreast of changes to working practices.

Based on findings above, it is clear to us that establishing clear lines of communication and engaging employees in discussions about the business are absolutely critical to implementing Change Management successfully. After all, it is the employees who will be doing most of the legwork to make a new strategy works. They must understand the aims and objectives and be clear on why the plan has been introduced, how it will be implemented and what is expected of them. Leaders who get this right will find it much easier to gain confidence and support when making strategic changes.

3. PROCESS OF CHANGE

To understand this better, we could refer to the psychology of change publication "Field Theory in Social Science" which identifies the process change into three stages;

Stage 1: Unfreezing (Pre-implementation)

– a stage where people overcome inertia and dismantle the existing mindset.

The pre-implementation stage basically addresses the question of the needs for the change. For example, the need for the change may be to improve service delivery or the need to comply with governmental directives. At this stage, the non-human challenges include incompatibility and service disruption.

a) Incompatibility - The proposed process might not be compatible with business and procedural realities. If the Management embarks on the process change that is totally incompatible with realities, it would be disastrous and costly to the organization. Therefore, it is necessary to determine the extent of the compatibility with the reality and the extent to which the new system can be adapted to achieve the predetermined process change objectives in line with the overall organizational objectives. To overcome this, it will be advisable to obtain external experts to assess on the suitability and compatibility of the proposed process from the evaluation stages.

b) Service disruption – Often when organization embarks on new initiatives especially in the service industry, the service will be disrupted during the period of change. In some existing cases, it will affect the overall existing quality of service delivery. The last thing management would like to avoid is disruption in the system especially where customers would be directly affected. It can damage organisation's reputation during the change period and customers switching to competitors permanently when the disruption is very material. The challenge will be on how to balance the requirement to change the process and maintaining the same level of service quality. Possible solutions include carry along members and customers before the implementation stage to prevent or reduce possible resistance from customers; and/or increase the number of service points during the transition.

Stage 2: Implementation – when the change occurs, it is typically a period of confusion due to the fact that people are now encountering new processes differ from what they use to.

Implementation of the decisions made at pre-implementation stage often has problems due to the facts that no one could envisage all the likely problems that will be faced or may, for whatever reasons, not disclose until the management has committed to the exercise. Many process change projects have been abandoned half way through after huge funds and management time have been committed. This was because the change programs are already faulty at pre-

implementation stage which often culminates serious problems that truncate the process change at the implementation stage. It is necessary for management to set up a committee who will proactively identify problems and resistance during the implementation and finding solutions immediately. When it cannot prevent it from happening, it should at least find effective solutions. The committee should also be composed of all departments affected by the process change and should meet on a regular basis or as and when the need arises. All external and internal stakeholders in the system should be involved as the implementation progresses to ensure better understanding and cooperation. If the change is not realistic and unattainable, stakeholders would not buy into the change and the process of effecting the change. Criticism should also be encouraged from the proponents and opponents of the change and should be objectively analysed.

Stage 3: Refreezing (Post implementation)

– a stage where the new mindset is crystallizing and a comfort level is returning at previous levels.

This stage is basically concerned with ensuring the process change achieves the predetermined objectives. Problems relating to post implementation stage are also identified and sorted out quickly although it would be milder than when it was at pre-implementation and implementation stages.

Challenges at this stage would include the following;

a) Lack of or inadequate training

New change programs normally introduce new processes. Majority are reluctant to learn new ways when time and deep concentration are required. They are more likely to find reasons to condemn the new application. Therefore, it is necessary for the management to train them at all stages of the process change implementation including activities that make them feel as if they contribute to the success of the change programs.

b) Culture clash

Culture differences happen in a situation where the organisations have been operating independently with distinct processes, vision and beliefs are fused together as an entity under a common process, vision and beliefs. A good example is when one company takes over or acquires new company. Staff at acquired company may resist leaving their old ways of doing things and work under new

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culture introduced by acquiring company. These differences should be identified and streamlined first before getting the commitment from the staff involved.

One last critical component that management always forgot to consider is disaster recovery and contingency plans at all stages of the process change. These plans help to ensure that the organization can continue its operations with minimal disruptions should the change process implementation fail.

The understanding of these challenges is of equal importance in coming up with comprehensive change programs apart from the change itself. The success of the change programs depend highly on the ability of the management to address these concerns at interval and include it as part of the strategies in managing change so that they can act positively with hindsight should the problem occurs.

Change Management in Practice – Learning from the Best

I have the opportunity to interview one company which won the Excellence in Change Management Award at the Global Excellence in Management Awards 2013 (GEMA) recently. The company is SAJ Holdings Sdn Bhd, a water operator for the state of Johor. In his brief summary on how the Company transformed from a body under the State Government to dynamic company that it was now, Encik Ikmal Hisham Rahim, Head of Human Resource for the company highlighted a number of interesting facts. He highlighted **centralization and culture** as the key factors that first requires change before anything else. Right after the privatization of the previously corporatized and highly regulated water body, the structure was decentralized with district “warlords” operating with full power over their own territories. These warlords decide autonomously on how to run their operations with different set of rules and procedures. The standards were different from one district to another. What they did next was to bring all these district warlords to headquarter and appointed each of them as Head of Sections and/or Departments. This was done with the sole purpose of centralising the command of control with all districts now reporting direct to headquarter. A new set of standard operating procedures and policies followed after that with all districts adhering to one standard way of operating.

Encik Ikmal also noticed that change program and initiatives could never happen successfully without changing the work culture. Therefore,

once the structure was centralized, they immediately embarked on setting up new work culture by influencing the *values, beliefs* and *practices* of their existing employees who are mostly local Johoreans. This was done by tapping on Johor’s unique culture of practicing Islam as a way of life, respect of the elderly, family unit orientated and looking up at strong leadership as way to influence the values, beliefs and practices. The unique culture of Johoreans mix well with the new culture introduced that focuses on integrity, customer focus, teamwork, discipline, passion and learning. It took them a number of years to instil and nurture this new culture to the workforce by organizing Islamic-related programs such as tadarus, Eid ul fitr and haj celebrations, tazkirah, “majlis ilmu”, ESQ and parenting program. Once the intended culture is well-received and practiced by its people, then only they introduced initiatives to make the full transformation. Among the Change Management programs that they implemented to become a World Class company includes Balanced Score Card, Performance Appraisal, Knowledge Management, Six Sigma, ISO, Customer Charter, Succession Planning, Competency Dictionary (mapping of required competency of staff position), Staff Training and Development, TAP (“Tanyalah Pengurus”, a dedicated program to meet the staff), Mentor-mentee system, comprehensive compensation scheme, manpower requisition guidelines and many more. Based on their latest record of Employee Satisfaction Index, the scores are on average well above 80% indicating a very happy and satisfied employees with the way the organization is run.

The Company experienced setback when they first embarked with the initiatives at company level due to higher number of staff in the workforce (about 2,200 employees). The change initiatives from the top took longer time to materialize due to geographical reason as the staff were scattered all over Johor. To escalate the change programs, they identified and employed Change Agents. Each change agent was responsible to implement the change at his/her area of control. This created a clusters of change which when accumulated brought about a fast dissemination of ideas and practice to the staff. As a result, the change programs were easily felt and understood by majority as they, in some ways, had a part in the change progress, creating accountability and responsibility on the success implementation of the change programs.

In his recap, En Ikmal did also share on the new trend from Generation Y who are less collaborative and prefer to work in silo. They

are also motivated by quick reward and would not care with any change programs if it does not address their needs for recognition. Current change dissemination strategies are now less effective and would require new ways to handle the demand from this generation. This would be their next challenge which we will be interested to learn from later on.

(Note: At the time this article is published, the “Success Story of SAJ” is currently in the process of being documented by a researcher from INTAN which will be published as reference nationwide).

Conclusion

It is imperative that significant consideration be put on the holistic approach in the change management. It requires time and motivation to keep with the planned change and to make it successful. It can be really rewarding if it is carefully thought through and implemented. With proper plan, concerted efforts from all employees, clear direction and communication from top, the change will be imminent and should result in improving the atmosphere in and the health of the organization. Learning from the experience of award winning company in Change Management proves that the combination of modern management gurus and Islamic teachings provides further impetus in a way that people can experience change differently but successfully.

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Interview with Dan Barry and Andy Barry

Daniel T. Barry is a former NASA astronaut and a veteran of three space flights, four spacewalks and two trips to the International Space Station. He retired from NASA in 2005 and started his own company, Denbar Robotics that creates robotic assistants for home and commercial use, concentrating on assistive devices for people with disabilities. In 2011 he co-founded 9th Sense, a company that sells telepresence robots.

The motivation to be an astronaut changed during my lifetime. At first it was go fast with smoke and fire behind you, but as I grew older other layers were added; the intellectual layer; exploration layer; and the how to make a difference in the world layer.

Being a doctor or an engineer is very important, but being an astronaut was to push it a little past where it would have been if I hadn't been here. Having gone to space, the bigger impact to the world is by going out inspiring kids; sharing with them my journey. There are a lot of astronauts in this world but I wanted to do something a little bit more. I inspired children to follow their dreams, to not give up, and to ensure they do not listen to the people who tell them they cannot do it.

Dan Barry

Former Astronaut

President and founder, Denbar Robotics

Director and co-founder, 9th Sense Robotics

Leading My Dreams

Fire & Smoke Passion

I dreamt to be an astronaut since I was a child. I had the opportunity to live at the end of a runway where I would hang off the chain fence and watched the airplanes went by daily. There was this driving passion about flight, space, and astronomy.

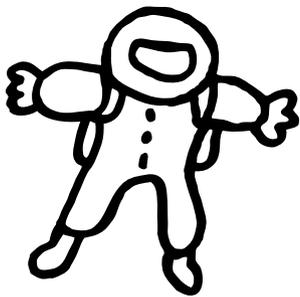
Heroes and Inspirations

Astronauts of that time definitely inspired me. They were my big heroes. However, it is the family; the people you see every day, who

insights & viewpoints

● [REC]

Being a doctor or an engineer is very important, but being an astronaut was to push it a little past where it would have been if I hadn't been here.



love you, encourage you, and teach you; that make a real difference. My father died when I was really young, and my three elder sisters really took care of me. One of my elder sisters was married to an engineer and he was the one who taught me how interesting solving mathematical puzzles could be. He showed me the beauty of building things based on mathematics which really directed the rest of my academic career.

The Neurone interest

After I finished working with NASA, I developed the idea and interest in knowing how the brain works. It would be an interesting accomplishment to build a machine smart enough to sense and understand the world to the point where it became aware of itself. So I started a project in my basement.

My wife who is a neuroscientist said: "Putting a brain in a box is not going to work" and she brought me out to see the birds, squirrels, chipmunks, rabbits, trees and grass. She said: "The difference between the trees and grass, and all those kind of creatures is that the things that run around and move have a brain, but for things that neither interact nor move and do not influence the environment does not have a brain. Filling a box that cannot move, interact or do anything with the world is never going to have a need for a brain".

Another example; the sea squirt (Tunicate) - sea creatures that swim around in their

larvae stage but upon becoming adults attach themselves to a coral or to the bottom of the sea and consume their brains as they will remain stationary for the rest of their life and have no need for their brains because they will not swim around anymore.

It was a huge insight to me that movements are tied to cognition. This meant that I had to build a robot because that is the only way it can manipulate, sense, and be in the world. That is the only way to get something to recognise it exists.

Thus my big goal is to create a machine intelligence that knows it exists!

Flawed intelligence

Robotic intelligence is an interesting concern. There are definitely needs for safety features and rules to safe guard us. However, looking at where robots are today, we are far from robotic invasion or empowerment; if my robot tries to take over the world all we have to do is close the door and it cannot get out of the room.

At the level we are at today, robots aren't smart enough and it will be a while before it is, but eventually these are the things we are going to have to confront. We may not know when something becomes aware of its existence because we do not know where in the animal kingdom creatures have self-awareness. There is no test that identifies where in the animal kingdom things know they exist.



I think there is a dim awakening, a spectrum that's going to happen with Artificial Intelligence (AI), we will not recognize it and when we do, it will not be recognition as much as attribution. People will say "this robot acts enough like a human, it shall be attributed with self-awareness", as opposed to the robot saying "hey I'm awake". Therefore, in reality, robots are mostly going to be kind of dumb.

However, the idea of equipping robots with weapons is a bad one. But it is a growing trend with military robots. This is more from the aspects of autonomy of the weapon system. The concept works by which if a robot has a lot of restrictions and protection against it firing by mistake; it would be a slow and careful robot. So a robot with less safety features is faster and more attractive, but then the opponents will be prone to making their robots with lesser safety feature to combat this. Soon enough we are giving the robots the authority to shoot without asking. This is a concern of safety feature but not from the AI perspective, and we do need to work on this.

Singularity University | 10⁺ Team Projects

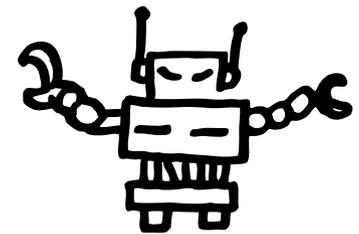
The 10⁺ project created by Singularity University aimed at bringing together people interested in rapidly changing technology in a variety of fields. The first basic premise is to increase information technology that can be used to further increase information technology, creating an exponential curve, changing that technology fast as it builds upon

itself. This is also a useful tool for predicting what and where technology will be in the future. For example, 3-4 years ago I designed a robot that uses sensor costing USD1000 knowing that I can sell my robot at USD100 after 3 to 4 years of research as the sensors will be 1/10th the price it was. Being able to predict the state of technology enables good R&D decision making, because to choose R&D based on today's technology would make it out-dated in 3 to 4 years.

The second premise is to use rapidly changing technology to address the major kinds of challenges such as poverty, water, energy and agriculture; finding the technological solutions towards issues that are going to become or are already serious issues for humanity.

This project is a 10 weeks summer programme that brings together a group of about 80 students typically in their late 20-ties or early 30-ties with a driving passion to change the world, ready to leave their jobs or completely change direction and do something that has an impact. This programme is not about a one way communication where the students are taught and then told to do things; instead it is where we do things together. It is their motivation, curiosity and drive that inspire me. To say that I can help them reach their goal reenergizes me. I go there to learn from them and share their passion. In fact, 9th Sense Company which we started a year ago came from this summer programme's students and teaching fellows.

10⁺



● [REC]

If you are going to read your children books, do not read them children books that they like because you will not look forward to reading the book.

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Sentinel parents-empowered children

My son was taking apart objects from two years old and I'm not sure how much we influenced him as much as we just enabled his choices. It is okay to break objects or fail because how are you going to learn if everything works right the first time. If everything works right the very first time will make you lazy and not try hard enough. As an example, it is a bit daunting to have this overriding goal to be an engineer, but if it is simplified into smaller pieces and from a young age of 4-5 years the child takes up small activities relevant to engineering it will enable the child's development.

As parents, we are not set out to specifically inspire our children. For instance, my daughter did not have an immediate passion for engineering when she was younger. She enjoyed interesting puzzle-solving, so I would give her puzzles to keep her challenged. It is important to challenge them intellectually. If you really listen to your children they will tell you what they really want to do. The big key is listening to what they want to say because we tend to tell our kids so much stuff. Sometimes we should step back to watch what they are interested in.

A match from heaven

The projects I worked on were not done to push my children to become engineers; they were simply projects that I liked. Neither did I do dumb-down projects thinking the children will not understand it. Instead, I did sophisticated projects of my interest, and when they wanted to participate, I found ways to give them bits and pieces that they were capable of. Doing the project together was a lot of fun. This never felt like an obligation to ensure my children would learn. Instead, it was more of me wanting to do projects and that

they were welcome to join, and that kept me excited.

My wife would take apart biological systems in the same way. She dissects creatures and so on. She inserted electrodes in individual cells of creatures' brains and figured out the process by which these cells would change and learn things. We are the curious bunch and love solving puzzles in our own way – biologically and mechanically. I think we have almost a complete family.

Books our Bonding Agents

I read books to my children. Since we lived apart due to work, I would call them and talk for over an hour plus. I chose the books, especially at the beginning, because they would either choose books I wasn't interested in or that have been read. If you are going to read your children books, do not read them children books that they like because you will not look forward to reading the book. The idea of engaging the children in things that you enjoy is the way to keep you interested and excited. It also about being transparent to the kids, they know when parents are bored and only pretending to do something interesting with them. However, if it is something that you are intrinsically interested and the kids join, that is a much more powerful approach.

Happiness is the Key

When you find what keeps you going without a care of how tired you are, and that you just keep on doing it, is an indication that you have found the key to happiness. Number one is to find "that thing", to the extent that even if it doesn't involve monetary value you still do it. But, of course, getting somebody to pay you a little bit to do it would make it more meaningful.



● [REC]

We may not know when something becomes aware of its existence because we do not know where in the animal kingdom creatures have self-awareness.



Andrew Barry's robotics experience includes hardware and software design for fully autonomous watercraft and utility vehicle systems as well as numerous smaller land and aerial robots. He has worked on navigation and obstacle avoidance using laser rangefinding and vision systems, and reliability tools for a commercial robotic warehouse distribution system. With the spirit of making science interesting, Andrew speaks and teaches about robotics worldwide and has received best paper and best presentation awards for his work.

Andy Barry

Like father like son

Fly With Your Dreams

The interest in engineering was actually geared by my father. Although he never directed me to be an engineer or a scientist, he was the one who influenced me. He taught me that engineering can be really fun and exciting. It was about solving new puzzles, and when I purposely messed up or broke something we would try fix it back again together. I absolutely want to fly like my father, but I just do not want to impact the world just a little bit, I want to make a big impact. I find that robotics is going to do just that, and I want to be one of those people who make it happen.

Additionally I have wanted to build robots for as long as I remember. That is very much the reason why I wanted to become and why I became an engineer.

One of the first robots I built constituted of getting a robotic truck with the controller rewired so that my father can drive it throughout the house. A camera was strapped on the top. Unfortunately the robot barely worked, but the lessons learnt taught me how fun engineering was and how to do those things based on projects. The overall success was questionable but the amount that we learned and the amount I was inspired from it mattered a lot.

Facing Research

Currently I am doing my PhD work on autonomous flight: designing aircraft about 70 cm wing span to fly through a forest. This is an interesting goal because it allows us to understand how robots are made to do complex dynamic manoeuvres that will enable it to dodge all the trees through a forest.

Our laboratory is a basic science laboratory and, with it, we are trying to understand how to make robots or flight system in general fly and move better. Our goal is very concentrated, that is to make this airplane fly through that forest, and this allows us to focus on the problems that really matters. With two

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● [REC]

Hands-on education is where the future of engineering education is going. The approach is more motivating and valuable, making education more fun and engaging.

algorithms that theoretically appear good, it is hard to tell which one is better when on paper. Algorithms are sensitive to factors in the real world such as small noises in the sensors and how the wind blows. These algorithms are put to test on the planes, and the one that rips the wings off first is the less preferred of both. It is all about the basic underlying algorithm that says this is how your robot works better with less motors and sensors, because that is what makes your robots cheaper and better. This works for all robots, planes and rockets and that is the real goal.

Broken helicopters. Hence I learn

One of my favourite parts about our workshop is that we break a lot of helicopters and it is okay because we bring extras. We watch and let the people wire the circuits in ways that we know are wrong, causing the circuits to blow up. This is where they learn a lot from, because people remember when they blow up the chips and that's where real learning happens.

Having more practical terms of education is a huge advantage. This brings about a good point as to why the workshop is really important. The workshop practices a completely hands-on approach with only a couple of minutes spent briefing the students and hours that the students spend on programming.

Hands-on education is where the future of engineering education is going and is really important. A good example is in first year my friend and me were working on a project to float a magnet through building a control system, but we had no idea how to achieve this. To solve this problem we started paying full attention and sat at the front rows of the next lecture and read notes from the previous lecture, and we managed to do it. It is these small hands-on puzzles that have driven my education from earlier on. Hands-on approach is more motivating and valuable, making education more fun and engaging.

The Knack for Projects

It is good to do projects. Find something you want to work on and do it. For instance, I taught myself the first C programming language when I embarked on a goal to make the web server work in the hot and stuffy attic. It was a success. Although the goal was insignificant, it created a lot of curiosity and added to the things I wanted to learn.

When you do projects, you understand and realise what being an engineer or a doctor is all about. Being a doctor or an engineer isn't easy, but engaging in things that we really enjoy makes us good at it and, in turn, enables us to become good doctors and engineers. The reason why these people in our workshop are good engineers and scientist is because they enjoy it. They are enthusiastic about it, and they stay up until 2 am in the morning willingly, and it is these people that are really good. Finding out what keeps you up until 2 to 3 in the morning is really hard, but once you do it is amazing.

Enliven passion of mutual interest

It was not only engineering projects that I was limited to, neither should all credit go to my father. One of my experience was when I was a freshman engineering student, we were faced-up with an oscilloscope; a screen with a bunch of knobs and dials that looked very intimidating for the first time. Not everybody knew how to work this machine, but I knew exactly how to operate it. I recalled experimenting on it when I was much younger. At that a time I was bored, and my mother wanted to distract me so she came up with this game that was to mess the oscilloscope in the worst possible ways then see if she could fix it which, of course, was she would fix it all. Each time I would learn ways to make it harder for mother and, by doing that, I learnt what each knob and dial did. So, although at the time I learnt how to use an oscilloscope I was not aware that I will face it in my career, it was these experience that also boosted my education knowledge and helped me out.

The idea is not to have a set goal and achievement that you wish to instil in your child, otherwise when 2 am comes your child would want to go to bed. However, if the project is something you enjoy, 2 am will come and you will be enthusiastically staying up with your child to keep doing it.

Even though I am not a parent yet, but when the time comes, I'll do as what my father did. It was to pick something he really liked to do and share it with the children. Your children will see that you are excited and you'll be really good at it because you like it.

What's the score?

Currently, Malaysian students are at the bottom one-third among others country in international assessments like Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMMS).

The Education Ministry has set up a special task force in February 2012 to look into ways of improving the standards of Mathematics, Science as well as languages amongst Malaysian students who undertake various international assessment programmes.

The Malaysia Education Blueprint has set the goal for Malaysia to be in the top third of countries participating in Pisa and Timms by 2025.

Programme for International Student Assessment (PISA)

More than **510,000** students in **65** economies took part in the 2012 test,

which covered **MATHS, READING and SCIENCE,**

Asian countries outperform the rest of the world

according to the OECD, with Shanghai, Singapore, Hong Kong, Taiwan, South Korea, Macau and Japan amongst the top performing countries and economies

MATHS – is a “strong predictor of participation in post-secondary education and future success” as stated by OECD



THE MALAYSIA EDUCATION BLUEPRINT has set the goal for Malaysia to be in the top third of countries participating in PISA and TIMMS by 2025.

SOURCE : OECD, PISA 2012

PISA IS ADMINISTERED BY THE OECD EVERY THREE YEARS ON 15-YEAR-OLDS IN BOTH OECD AND NON-OECD COUNTRIES

PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT (PISA)

MALAYSIA RANKED:

52ND
out of **65** countries

MALAYSIA SCORED:

IN 2009	AND IN 2012
404 Mathematics	421 Mathematics
414 Reading	436 Reading
422 Science	420 Science

* an average improvement in maths performance of more than eight points per year

Below the global average score :	494 Mathematics
	496 Reading
	501 Science

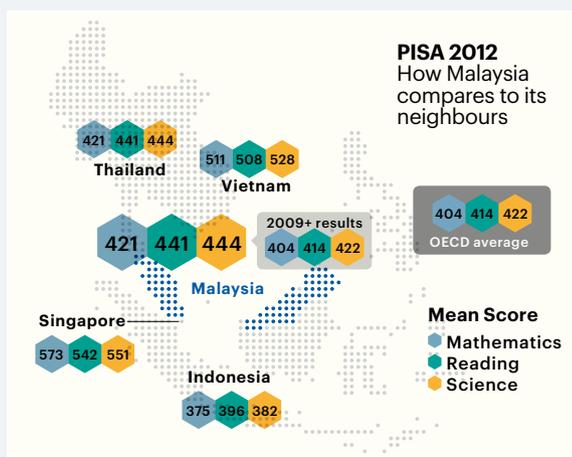
SOURCE : OECD, PISA 2012



Boys scored higher than girls in maths in 37 out of the 65 countries and economies



Girls outperformed boys in just five countries; Jordan, Qatar, Thailand, Malaysia and Iceland



Maths

Girls “feel less motivated to learn maths and have less confidence in their abilities than boys”

Reading

The gender gap in reading performance - favouring girls - widened in 11 countries

Science

Science, boys and girls perform similarly

TIMSS 2011, **35 per cent** and **38 per cent** of Malaysian students **failed to meet minimum skill level in Mathematics and Science**, an increase of two to four times more than seven and thirteen per cent in 1999

insights & viewpoints



Research Challenges: Collaboration and Community



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Research and development (R&D) is important. If we agree and accept that opinion, then the next step would be the prioritization of its implementations and applications.

Prioritization could differ depending on situation(s) surrounding a particular state/country/community. Decisions to place prioritization for R&D could be based on a few indicators:

1. GINI Ranking, a measurement of wealth distribution. If wealth distribution is uneven

then prioritization could be or should be for state funded social programs.

2. GDP - Gross Domestic Product. If the GDP is well below critical mass, focus might be applied to low value chain activities to drive the economy.

3. Dependency of Export (how insulated the economy is).

Currently, Malaysia is placed 26th in the World Economic Forum competitive ranking and classified as efficiency driven economy. Ours

According to the World Economic Forum on East Asia Session Summary 2008, 'China generates an eye-catching number of graduates in high-level science and math; but researchers in Malaysia, while fewer in number, tend to be higher-paid and more productive'

is not an innovation driven economy. We lack behind the developed nations in terms of patent performance. Based on the data for 2009, our patent performance is at 5.7 utility innovation per million (population). This is not surprising since the percentage of GDP for R&D stood at 0.64% of GDP as of year 2006.

Does Malaysia need to increase the percentage? Before the decision is taken, there is a necessity to look at prioritization. Subsidization or expenditure for the educated class (via military industrial complex or grants) should be balanced with subsidization or expenditure for the working class (social programs). The challenge is to increase research output (inclusive innovation and products) without skewing wealth distribution. There is also a perception that the efficiency of patents production (per researchers) is high in Malaysia. According to the World Economic Forum on East Asia Session Summary 2008, 'China generates an eye-catching number of graduates in high-level science and math; but researchers in Malaysia, while fewer in number, tend to be higher-paid and more productive'.

A manager in an established research institute in Malaysia acknowledged that there are gaps that manifest itself between different parts of the value chain (specific to IT industry) – component suppliers, core product companies, system integrators (SI), and the market itself. System integrators are reluctant to accept new technology and bring it to market, thus continue to maintain the gaps between core technology and Monetisation of Patents and Ideas.

Efforts such as technology grants (MGS, Technofund), matchmaking (*IP Connect MDeC* – Patents holders meets Industry), *Agensi Inovasi Malaysia Commercialisation Lab* - Patent holders present their innovation to industry for further development and *Universities Commercializing Arm* – where universities try to find an industrial match for a particular core technology has produced some results, but the response is rather lethargic. Reason for this ranges from low short term return to, perceived risks involved. In short

there are efforts to produce technology but the response from industry and market is less enthusiastic. I partially agree with the gap stated but on the contrary there are takers for application based grants (Cradle Grant). But as of yet there is no analysis on the dynamics of how both of this types of grants is complimenting each other, or to put in another way how independent in nature are they. In hindsight there are room for improvement on working relationship between Universities & Research Institutes with Industry.

Within research institutes or universities themselves, collaborative synergy could be achieved by placing collaboration between different teams as a requirement or Key Performance Index (KPI) for new projects and the burden of proof should be on the principle researcher if he/she wants to pursue the R&D independently. Dr Gopi Kurup, CEO of TM R&D believes collaboration between research groups to pursue R&D goals is not only important but necessary, in comparison when we compare the number of researchers in HUAWEI and ZTE.

Through personal observation, there is a more intangible difficulty on collaboration between Industry and RI's/University; difficulty arising after the collaboration has been set. This intangible difficulty is the event by event communication between the two parties. Because the function between the two is almost distinct, there is no bridging between the qualms of the researchers and the qualms of the industry:

- 1) Mismatch of expectation: Researchers from RI's or University have an expectation the method used must be highly efficient (depends on how you define efficiency) and novel, but not necessarily to improve the bottom-line of user-experience.
- 2) Breakdown in (scientific) communication: There must be an understanding of how to measure performance, and for motivational purposes the reason of one method of measurement over another must be clear. Industrial researcher must learn up

mathematical form and nomenclature to improve communication and facilitate the transfer of knowledge.

1. Areas of Contention: Once there is a perceive profit to be made from a collaborative effort, then there will be two areas contention of conflict between RI's/University and Industry, namely IP (Patent) and Profit Sharing especially ones that is derived by the new contented IP (Patent).

How to improve this situation? Like any other problems in communication, empathy goes a long way. Both sides need to understand each other technical qualm and there must be an aggressive step from both parties to understand, to a certain extent, the actual technical/scientific/mathematical problems. Like any sustainable system there must be a reinforcing agent or vector to move this forward (what I meant by reinforcing agent is not medium term KPI's like IP but rather how to improve the communication specifically).

Assuming there is no such thing as pure capitalism, Government or GLC with pro-local policies can contribute to the research ecosystem – which is against mainstream neo-liberal ideals but almost an absolute rule in the historical development of the first world. In China and Korea, there are percentiles allocated for local technologies to be applied to projects. This must be done tactfully because a foreign technology repackaged by a local company could be misconstrued as local technology. This comes down to governance on how to measure the level of local contribution to that technology.

Digression: supply of researchers to the R&D ecosystem. I believe that an education system that supplies high quality professional does not necessarily supply high quality researchers. This, I believe, is because of the different thought process that a good professional might have as appose to a good researcher. Tendencies are different, and what they reflex to might be different. I leave this to be thought upon by the reader.

Malaysia: Where are we?

Malaysia aspires to achieve developed status by 2020. This aspiration is not a pipedream as Malaysia is highly competitive and may be able to shift from middle income to high income within a couple of decades. This section shares the current profiling of Malaysia and beyond 2020.

SOURCE: INNOVARO

DEMOGRAPHY

Malaysia is completing the demographic transition from developing to middle-income nation, with a slowing birthrate, rising age, and increasing urbanization.

Rising Age



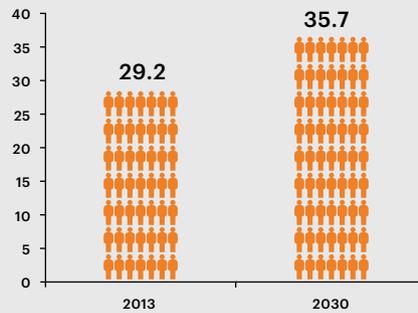
Population by broad age groups

Age group	2013	2013
	Population (millions)	Population (millions)
0 - 14	8.6	8.8
15 - 64	19.4	24.1
65+	1.6	3.7

Today, Malaysia is demographically young: with more than five children for every senior.

However, in 2030 the percentage of the population over age 65 will nearly double.

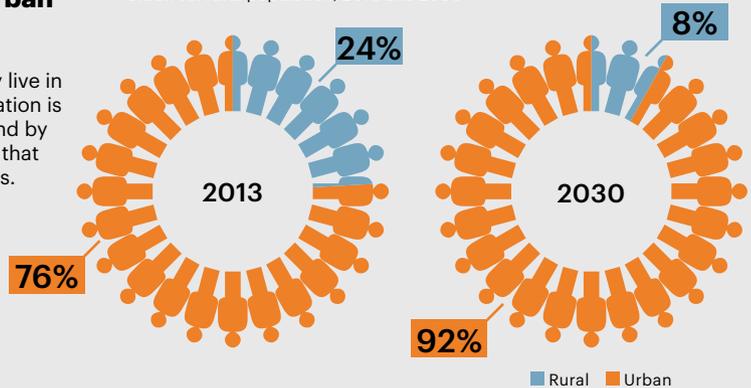
Total population, 2013 and 2030, in millions



Increasing Urban Population

Three-fourths of Malaysians already live in cities, but urbanization is still proceeding, and by 2030 it is forecast that 92% will be in cities.

Urban vs. rural population, 2013 and 2030



Slowing Birthrate

The growth rate is falling, and is expected to be only about half its present level by the 2030s.

Population growth rate



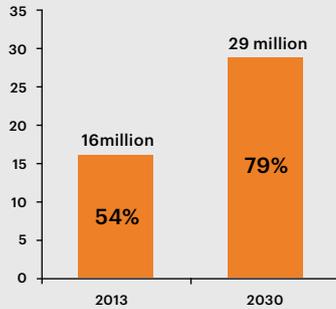
SOURCE: UN DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS

CONSUMER LIFE

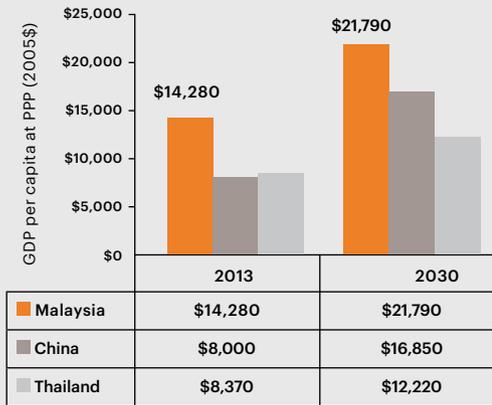
Middle Class

The middle class is projected to rise rapidly over the next two decades, rising to 29 million representing 79% of the country's population.

Size of middle class

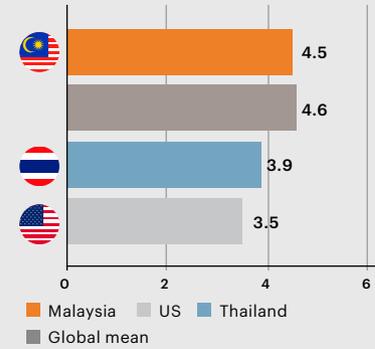


Income — GDP per capita at PPP (2005\$)



Other than Singapore, Malaysia is the wealthiest country of Southeast Asia. By 2030, Malaysia will be on par with incomes in Eastern Europe today.

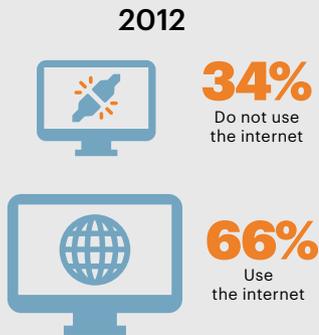
Buyer sophistication



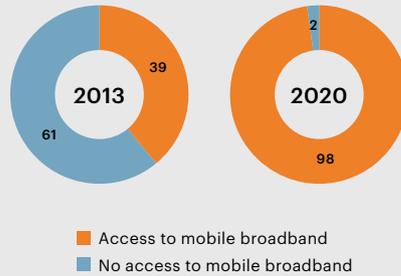
The World Economic Forum (WEF) poll among global executives about buyer sophistication revealed that Malaysia scored well above average—on par with the US or Germany, and higher than its neighbour Thailand.

Two-thirds of Malaysians have internet accessibility.

Percent Internet users



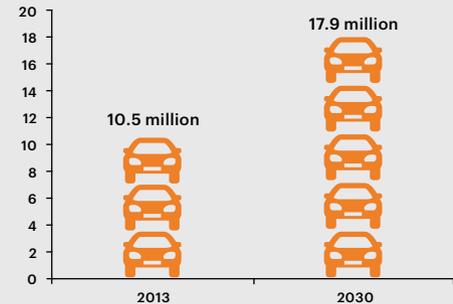
Population with access to mobile broadband (per 100)



M-commerce is growing rapidly in Malaysia, and taking up an increasing proportion of all e-commerce.

SOURCE: DIGITAL NEWS ASIA

Number of cars and trucks (all types), 2013 and 2030



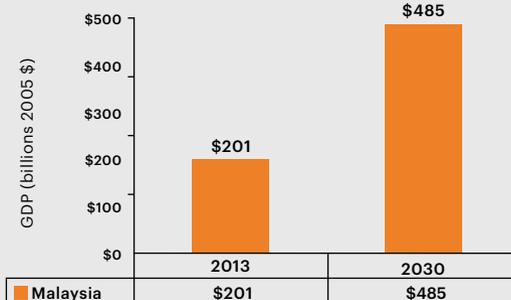
Vehicle ownership is relatively high for an emerging-market Asian country; at 361 cars and trucks per 1,000 people, it is the same as highly developed South Korea as of 2013.

Thailand: 127 Indonesia: 93 Vietnam: 16

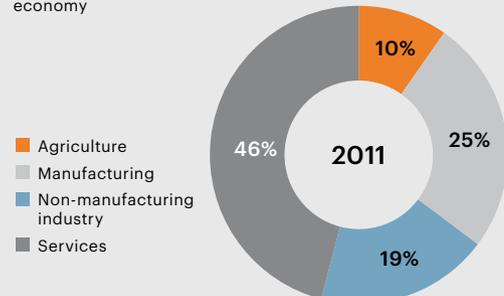
BUSINESS CONDITIONS

The Government is pursuing its multifaceted New Economic Model to double the per capita income by 2020.

GDP Forecast



Structure of the economy



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THE EXTREME FUTURE: THE TOP TRENDS THAT WILL RESHAPE THE WORLD IN THE NEXT 20 YEARS

Author : James Canton

Publisher: Plume

ISBN 10: 0452288665

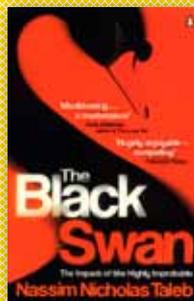
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THE BLACK SWAN: THE IMPACT OF THE HIGHLY IMPROBABLE

Author : Nassim Nicholas

Publisher: Penguin Books Ltd.

ISBN 10: 0141034599

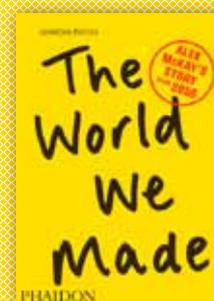
ISBN 13: 9780141034591

Nassim Nicholas Taleb refers to the book variously as an essay or a narrative with one single idea: "our blindness with respect to randomness, particularly large deviations." It is Taleb's questioning of why this occurs and his explanations of it that drive the book forward.

The book's layout follows "a simple logic" moving from literary subjects in the beginning to scientific and mathematical subjects in the later portions. Part One and the beginning of Part Two delve into Psychology. Taleb addresses science and business in the latter half of Part Two and Part Three. Part Four contains advice on how to approach the world in the face of uncertainty and still enjoy life.

Taleb acknowledges a contradiction in the book. He uses an exact metaphor, Black Swan Idea to argue against the "unknown, the abstract, and imprecise uncertain--white ravens, pink elephants, or evaporating denizens of a remote planet orbiting Tau Ceti."

There is a contradiction; this book is a story, and more people prefer to use stories and vignettes to illustrate our gullibility about stories and our preference for the dangerous compression of narratives....You need a story to displace a story. Metaphors and stories are far more potent (alas) than ideas; they are also easier to remember and more fun to read.



THE WORLD WE MADE: ALEX MCKAY'S STORY FROM 2050

Author : Jonathon Porritt

Publisher: Phaidon Press Ltd

ISBN 10: 0714863610

ISBN 13: 9780714863610

Our planet's environmental future is usually described in terms of doom and despair. But now, for the first time, *The World We Made* presents a credible, positive vision of our planet that is green, fair, connected and collaborative. Part history, part personal memoir, *The World We Made* reveals how it is possible to reach a genuinely sustainable world by 2050; describing the key events, technological breakthroughs and lifestyle revolutions that will transform our planet. Packed with images that bring to life this exciting, high-tech and human world, featuring futuristic photographs, graphics and hand-drawn sketches, *The World We Made* covers topics as wide-ranging as the 'energy internet' to slow travel airships; 3D printing to robotics; and personal genomics to urban agriculture - all grounded in cutting edge technological insights. Providing all the tools and advice to prepare yourself for what is ahead, the book is essential reading for everyone interested in a positive future for our planet. All royalties will go to support the work of Forum for the Future, one of the world's leading sustainable development non-profits.



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