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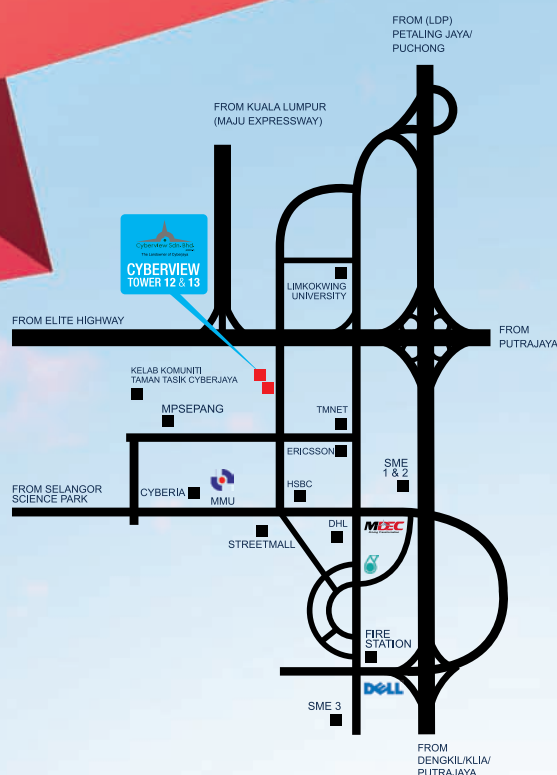
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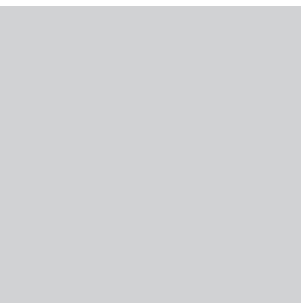
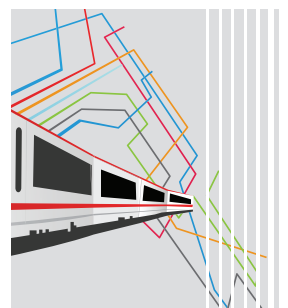
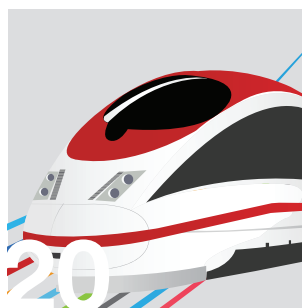
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CONTRIBUTOR

Ani Suzila Anas
Natrah Mohd Emran
Amallia Ahmad Zaini
Mohd Kamaruzaman Abdullah
Ahmad Nazri Abudin

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Malaysian Industry-Government
Group for High Technology
Prime Minister's Department
3517, Jalan Teknokrat 5
63000 Cyberjaya,
Selangor Darul Ehsan
www.might.org.my

FOR INQUIRIES

myForesight®

Phone : +603 8315 7888
Fax : +603 8312 0300
E-mail : foresight@might.org.my
Website : www.myforesight.my

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Editor's note



Initial Thoughts

BY
RUSHDI ABDUL RAHIM
 Director
 myForesight®
 rushdi@might.org.my

Greetings and salutations from all of us at myForesight®. The time between the publications was pretty eventful and exciting. I am glad to say that you are now reading a publication produced by the Malaysia's very own National Foresight Institute, thought we still like to be known by myForesight®.

As previously mentioned the institute was created as an effort to mainstream and expand foresight beyond MIGHT scope of focus areas and activities, although we are still under the purview of MIGHT. We certainly hope the creation of the Institute will promote collaboration and joint effort of foresight in various fields' and subject matter with multiple organizations for the benefit of the nation.

The creation of the institute would not have happen without the effort, contribution and support of a number of individuals. There will be too many names to list (you know who you are) but our thanks will definitely goes to both the Joint-Chairman as well as the President/CEO of MIGHT for having the vision and believe in the importance of foresight.

However one of the important concepts about foresight is to learn from your predecessors. Therefore I would like to acknowledge those who have come before me, head of MIGHT's foresight program who have laid the foundation to enable the creation of the National Foresight Institute. Many thanks to Mohd Zakwan Mohd Zabidi and Nik Ahmad Faizul Abdul Mallek.

On the topic of learning from your predecessors, unfortunately in today's world, these lessons are too often is neglected. We live in a world consumed with the present. Little thought is given to what's come before or most significantly what lies ahead. While drawing valuable lessons from the past, we need to stay alert to current, emerging, and future challenges. Despite being aware of the trends and challenges, too many countries, organizations, and individuals today

suffer from the afflictions of having a myopic view of being short-sighted.

Look around and you will find; too many individuals focus on their next pay check, too many organizations focus on the next quarterly earnings report, too many politicians focus on the next election cycle rather than the next generation and too many countries focus on their world ranking and position rather than realizing that we are all inhabitants of this planet.

There is a need for individuals and organizations to take the long view and consider the broader impact of our actions on the world, whether it's economic, environmental or societal. The same can be said for the need for countries to consider the longer-term implications of their current policies, programs, and proposed actions.

By having foresight; considering the long-term implications of current trends and proposed policies, we can capitalize on opportunities and reduce the risks that lie ahead. Partnering and working together will be essential. We're going to need to start rowing together or else we risk sinking separately. Because with the complicated problems our world is facing, nations, institutions, and individuals cannot afford to go it alone. We must join forces with others and apply our collective expertise to solve shared challenges.

This is what National Foresight Institute hope to inculcate by asking the right questions and exploring future possibilities. This partnership is evident in the way we do things, even in the way we bring you this magazine through contributions of our partners.

“One of the important concepts about foresight is to learn from your predecessors. Therefore I would like to acknowledge those who have come before me, who have laid the foundation to enable the creation of the National Foresight Institute”

As usual the magazine has to date provide a means for us to reach our stakeholders and hope to continually do so in making the magazine beneficial and thought provoking. My gratitude goes to the willing contributors whose viewpoints and expertise have definitely enriched the content of the magazine.

After reading the magazine, we expect you to have your opinion on certain matters. You might agree or disagree. Whichever it goes, we want to hear them. We welcome your feedback and contributions.

National Foresight Institute Launching



Leader's insights

Foresight is not just about tomorrow, but years to come. We have to look at 20-50 years from today – what trends are going to happen and to make necessary adjustments today.



In person with ...

Tan Sri Datuk Dr. Ahmad Tajuddin Ali

On The Future...

Foresight is not just about tomorrow, but years to come. We have to look at 20-50 years from today – what trends are going to happen and to make necessary adjustments today. The future is bleak ... and this is not the 'feel good' time because my view of the future – 20 to 50 year's time – is indeed bleak for this country. I have my own reasons, but I really hope that when the time comes, I'm proven wrong.

There are many factors and indicators that show we are not heading in the right direction. Let's start with the global challenges. There are big issues being debated in all international forums, for instance Rio +20. During Rio +20, The International Institute for Applied System Analysis (IIASA) presented the global energy assessment which shows that the world is facing challenges, namely in energy, climate change, food security, food production, poverty and equity. All these challenges are interrelated and each one feeds the other.

We certainly cannot extract ourselves from being in that predicament as part of the global community. For example, food crisis, energy crisis and poverty issues in Africa will become even more critical as we go forward. Continuous consumption of energy due to growing population is impacting the food prices and distribution.

Energy prices will continue to escalate and Malaysia is currently importing much of our energy. Although we produce palm oil, the plantation will be competing with the growing population for land. Soon, those agricultural lands will be converted into housing and industrial area. At the same time we are facing the global demand and pressures to preserve our rainforest and greenery, hence, preventing further conversion of our virgin jungles into palm oil plantations.

I'm quoting a few known challenges in terms of rising population, increase cost of food production, distribution, and storage – the whole line of food security. Water scarcity is another global problem that is being faced in Malaysia too. If we look forward to 20 to 30 years from now, the water problem will be acute. All these issues – food shortages, energy crisis, water scarcity, etc. – will have an impact on us and hamper our growth. However, we are very lucky to be where we are today. We have exploited and make good use of our existing resources – labour, land and technology so far. But we know that it is not adequate. For instance, the labour cost in Malaysia is not as competitive as it is in China. Land scarcity and increasing land prices limit our ability to offer foreign businesses to open their plants here. When Malaysia aims for Knowledge Economy and moves towards higher income society there are also hindrances such as inadequate investment in R&D, small GDP etc.

On competitiveness...

In the context of global competition, Malaysia is, at the moment, too dependent on imported or foreign technologies and the people. This includes experts and their expertise, ownership of patent right, etc. – as the basis of our manufacturing and production. We need to extract more value from the resources that we have today. In palm oil, for instance, we need more than what we already have now. By going downstream we can produce higher quality products range across the value chain; from the raw materials to the end products. This can be done with the aid of our own scientists in our own laboratories, by generating new sources of intellectual property rights on products and processes. We can boost our production, locally or abroad, but hold the IP rights. We should try to reverse the current scenario where laboratories abroad use our raw materials for their productions but hold the IP rights, and sell back the end products to us at higher prices.

On Socio Economic vs. Technology ...

Basically, there are two types of people in this world that generate and create wealth. First, the agriculturists, planters, and farmers – they plant fruits or cereals, and create or generate fine chemicals from minerals in soil, air and water. Second, the technicians, be it chemists, engineers and so on. Through the use of S&T, they create a process that leads to higher value produces. While others – the accountants, lawyers etc. – help in managing the wealth created along the pipeline. The political system in Malaysia has evolved, enabling us to maintain harmony and peace. In spite of the other ingredients of instability, the basic ingredients are multi-racial, multi-cultural, multi-religion, and multi-lingual. People are contented and they are now looking at the next phase – environment, equal rights, etc.

The political statements are correct, but the will to carry through by the system such as funding for R&D and emphasis on science education system is vital. In an effort to produce the 'breed' that we want – a society that is scientifically literate – teaching science and mathematics should be made compulsory.

Beyond any shadow of doubt, we are enjoying political harmony and stability. This is because of the size of our economic cake is big enough and have continue to expand. However, if we are not able to keep this cake from expanding continuously, the basis of our harmony and stability may be shaken or even erode.

The strive to put food on the table for the family is paramount. We are talking about the whole society in general, about the masses. If our economy is not able to expand and compete on the global stage, that is if we are unable to export high value added products, we will lose out. Eventually,

Leader's insights

“At this point I am pessimistic. But I hope my pessimism will lead to actions being taken, actions that will prove 30 -50 years from now - although I may not be around to see it - that I'm wrong... then I will be happy.”

although the cake may not shrink, but it may also not expand as fast as needed to satisfy the growing demands and expectations of the community.

We must always remember that other countries are also trying and succeeding, possibly at a faster rate compared to ours. We must do something to maintain our competitive edge because we are sharing the same world market. We have to be ahead of the curve, ahead of the pack, if we want to sustain our competitive position. It is sad to say, the way I see it, the ingredients for achieving that competitive edge is not there.

On Theory of Abundance ...

The greatest danger to humanity is complacency. As for the theory of abundance, I would prefer to look from the opposite end. When we say there are pockets of abundance, there are also pockets of poverty. When I see towards 20 to 30 years in the future, I see regions in the world that will be very unstable due to poverty, hunger, overpopulation, etc. It has happened – in Somalia and Sudan. Inequity is the main cause of the instability, and the impact could be cross-borders. For example, the needs – rather than the demand – for water. Water is one example on competing demand for resources. Water source, may come from an upstream in one country and flow to a downstream in another country with the latter depending very much on what is coming from the former. There could be diversion of water resources in order to optimise the use by the upstream country, thus depriving the supply to the downstream country. This will cause the supply-demand conflict.

On Innovation Ingredients ...

Our education system aims to have 60:40 ratio of science to art students. Sadly, today we only have less than 30% students in the science stream. If this trend continues, future Malaysians will be pure consumers of technology. Only a small percentage of our population will engage in S&T, especially R&D thus, decreasing the chances of Malaysia to be a producer of technology that can contribute more to wealth.

Greater challenges are faced by teachers today compared to yesteryears. Continuous use of traditional teaching methods are no longer conducive as students are now sometimes ahead



of their teachers and become less interested to be in school. Unless the interest in technology amongst students is inculcated, nourished and developed, future Malaysians will be technology consumers, not producers. Only through strong foundation of science and mathematics in our education system, are we able to groom future researchers, scientist and innovators.

Talent is a key resource to move up in the technological scale in terms of ability and capacity. There is no point in allocating so much money in R&D if we don't have the human capital. Yes, we can open up our economy to outsiders, but indigenous capacity is vital. We cannot rely on foreigners as they will come and go within the context of their own analysis. For instance, if they find another country which is better and more competitive, they will move out. They may not fully translocate, but instead of expanding here, they will expand elsewhere. Therefore, our system and infrastructure need to be conducive enough to support and continue generating growth into the future.

On Regeneration of New Talent ...

One of the things that worry me is that we failed at regeneration of talents in the management of STI and R&D. There are several institutions that fail to leap forward from the foundations that were set by earlier founders. Somehow, these foundations have gone into some sort of oblivion.

Some of the institutions and organizations that were vibrant before are not moving forward because they are trapped in their cocoon. They are not creative and innovative to face current changes and challenges.

Staying in the same trajectory is fine, but if we stay at that level while everybody else is moving forward, we are actually moving backwards. The pessimism in me is for a good reason, and I would like to help. Through NSRC, for instance, we intend to reorganise things in order to redirect the ships that are already afloat to face stormy waters ahead.

There are so many other things that we can do to create and generate interest of the younger generation in S&T. Real innovation is the one that will really create value and has to be based on S&T, knowledge and strong foundation in science, engineering and mathematics.

At this point I am pessimistic. But I hope my pessimism will lead to actions being taken, actions that will prove 30 -50 years from now - although I may not be around to see it - that I'm wrong... then I will be happy.



About Tan Sri Datuk Dr Ahmad Tajuddin Ali

- Tan Sri Datuk Dr Ahmad Tajuddin Ali is the Chairman of UEM Group Berhad. He is a Registered Professional Engineer with the Board of Engineers Malaysia, a Fellow of the Institution of Engineers Malaysia and a Fellow of the ASEAN Federation of Engineering Organisation (AFEO).
- He is involved in many professional activities, boards, councils, and committees at national, regional, and international levels. Currently among others he is: Chairman of UEM Land Holdings Berhad, PLUS Expressways Berhad, Linde Malaysia Holdings Berhad and of the Energy Commission of Malaysia. He is also

the Chairman of the Malaysian Standards and Accreditation Council, SIRIM-SIME Technologies Sdn. Bhd., Malaysian Technology Consultants Sdn. Bhd, and the Joint-Chairman (Industry) of the Malaysian Industry-Government Group for High Technology (MIGHT).

- Tan Sri Ahmad Tajuddin is known for his passion in science and technology. He was the Founder President of the Malaysian Association of Research Scientists, the Malaysian Society for Non-Destructive Testing (MSNT) and the Malaysian Nuclear Science Society. He is currently the President of the Academy of Sciences, Malaysia and Malaysian Association of Research Scientists. He is also the Chairman of the National Council for Standards and Accreditation and a Member of National Science and Research Council (NSRC).

Experts insights

Forecasting the Technology Revolution: Highlights from the TechCast Project



BY

William E. Halal, Ph.D

George Washington University

Halal@gwu.edu

The strategic impact of technology is seen in the rushing change of everyday products. When digital photography became feasible a few years ago, the entire film industry was overturned by simply moving around digital bits instead. Nikon, Kodak, and other famous names that once dominated photography are still struggling to adjust, laying off thousands of employees and replacing product lines. In place of film, new industries soon sprung up as digital cameras unleashed floods of photos and videos to populate Web 2.0 – Facebook, YouTube, blogs, wikis, and more sure to come.

This cycle then repeated as smart phones, in turn, replaced digital cameras. Sales of stand-alone cameras started to decline with the landmark introduction of Apple's iPhone with built-in digital cameras and video recorders. The Flip camcorder, for instance, was widely popular because it was simple and easy to use. But the market dried up after a flood of smart phones with good digital cameras and video appeared in 2008, and the Flip was soon sold to a gentle death.¹ Kodak invented the digital camera years ago, but had to abandon the market to smart phones.²

The same disruptive force of technological change is at work as alternative energy replaces oil, genetic medicine extends lives, artificial intelligence automates jobs, robots serve as helpers, and other innovations reach the take-off point.

These simple examples highlight the threats managers face if they fail to adapt to strategic technological change, as well as the opportunities available at the leading edge. And shorter technology life cycles require that they act quickly or lose product lines. The only safe haven is to remain at the forefront of change.

This article presents an overview of the Technology Revolution and how corporations can compete in an era of economic transformation. We draw on a state-of-the-art forecasting system (www.TechCast.org) to outline strategic technological advances that are likely to enter the global mainstream and their expected impacts. Guidelines outline how business and other organizations use technology forecasts to form strategy, and conclude by aggregating our data to provide a "macro-forecast" of the next decade or so. Technology strategy is a powerful tool to help convert creative destruction into successful business ventures during the difficult years ahead.

THE COMING TECHNOLOGY REVOLUTION

To better understand the Technology Revolution, the TechCast Project at George Washington University (www.TechCast.org) provides authoritative forecasts across the entire technological spectrum. Technology forecasts are essential because society's collective technical "tools" comprise the economic foundations of the social

order, and so sound forecasts are crucial for anticipating product innovations and social changes. TechCast is a data-based website that pools the knowledge of 100 plus high-tech CEOs, scientists and engineers, academics, consultants, futurists, and other experts worldwide to forecast breakthroughs in all fields. It is possibly the best forecasting system available, covering the entire range of technological innovation and updated constantly. The Project was cited by the U.S. National Academies of Science and Engineering as one of the three best systems in the world,³ and web searches rank it No. 2 or 3 out of 52 million hits. No forecast can be really accurate, of course, but validation studies confirm this approach provides estimates accurate enough to put decision-makers in the right ballpark.

The results show that technological advances, their adoption patterns, and social impacts follow well-defined cycles that can be forecast rather accurately. Figure 1 presents highlights of this work for 70 leading technologies organized into seven fields. Some of these technologies are available commercially but they have not yet

Experts insights

reached the 30% adoption level where breakthroughs enter mainstream use. Following is a quick summary of how these advances are likely to affect various business sectors. Please note that these highlights are drawn from the website, and so details and references can be found at www.TechCast.org.

The Energy & Environment Crisis is an Opportunity in Disguise

Globalization is expected to almost double the number of people living at industrial levels over the next decade,⁴ producing commensurate increases in energy demands, pollution levels, global warming, and other aspects of the energy and environment crisis. Our forecasts show that green business is likely to take off in three-five years and governments are likely to take serious steps on global warming about that time. Alternative energy sources – solar cells, wind turbines, biofuels, etc. – are growing 30-40% per year, almost like Moore's Law. The global market for green technologies is expected to reach about \$10 trillion in two-three decades, larger than autos, health care, or defense. In short, the energy and environment mess actually offers a great opportunity in disguise.

Information Technology Changes Everything

Computer power should continue to double every two years; a second generation of optical, biological, and quantum computers is poised to take over; and artificial intelligence is automating routine tasks. The Web is the same age that TV was when it became the dominant force of the 20th century. Over the coming decade, working, shopping, learning, and most other social functions are likely to move online into a virtual world that is ever-present and intelligent. You might buy something by simply talking with a virtual robot that greets you by name, knows all the merchandise and displays it on demand, answers questions, and has infinite patience – the perfect salesperson.⁵

E-Commerce is Exploding around the Globe

Most e-commerce today operates at 10 -15% adoption levels, but online shopping, publishing, education, entertainment, and other services are likely to reach the critical 30% adoption level soon where new markets usually take off. And the huge populations of China, India, Brazil, and other developing countries are moving in droves to PCs, the Internet, and smart phones. We anticipate that five-six billion people will soon create online markets of several trillion dollars. The late C.K. Prahalad, a leading business professor, put it best: "The world's four billion poor should be considered the biggest source of growth left."⁶

Manufacturing Goes High-Tech

The factories of the Industrial Age are yielding to intelligent manufacturing systems operating worldwide to produce goods cheaply and quickly. Research in materials and nanotechnology is making it possible to create almost any type of

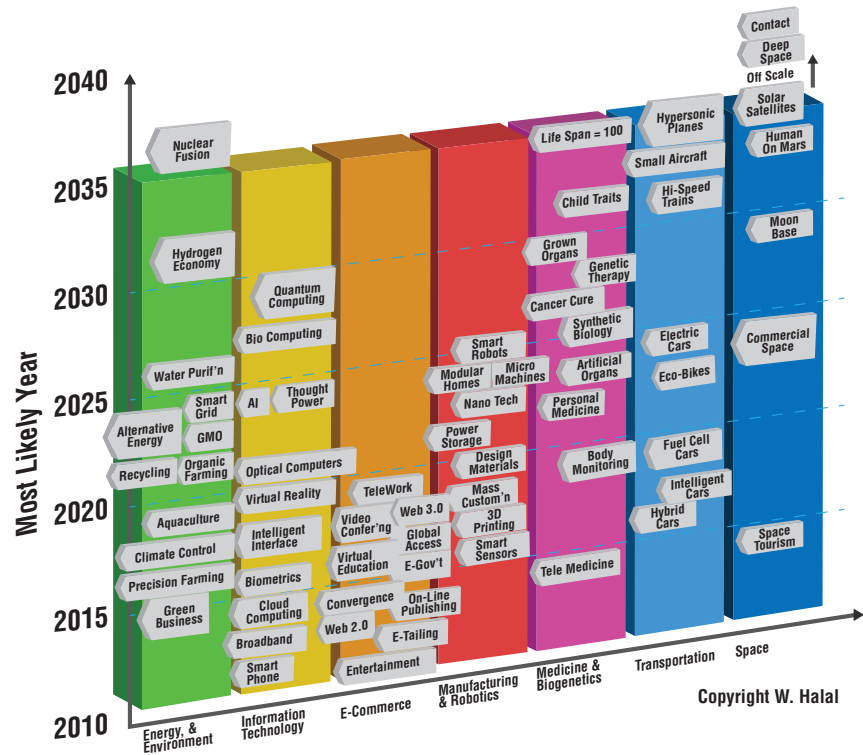


Figure 1 The Technology Revolution

product, and mass customization can deliver sophisticated goods designed for individuals easily. Attracted by cheap labor and new markets, industrialization is likely to raise living standards dramatically in most poor nations over the next few decades – along with mounting demands for energy, ecological damage, and clashes between diverse cultures. An industrialized world will be a boon to business, but making it sustainable is an enormous challenge that will test us severely.

Medical Advances Confer Mastery Over Life

Artificial organs are being developed to replace almost all bodily functions, including parts of the brain, and stem cell research is increasingly able to repair and grow organs. Electronic medical records, online doctor's visits, computerized diagnostics, and other forms of telemedicine should curtail rising costs and improve quality of care. Nanotech is being used to develop tiny devices that are intelligent enough to seek out cancer cells and destroy them. Just as the Industrial Age mastered most aspects of the physical world, these advances are now making it possible to master the biological world. Yes, it sounds too good to be true, but so did the notion that men could fly, much less to the Moon.

Transportation Is Moving Faster and Farther

Our forecasts show that a new wave of green autos powered by hybrid, electric, and fuel cell engines should become mainstream about 2013 - 2018, and we are likely to see intelligent cars that drive themselves. It may seem that information

forms a virtual world that parallels the physical world. People will always want to visit each other, handle the merchandise, and hammer out tough decisions together.

Space is Going Private

CEO Richard Branson's Virgin Galactic is likely to launch its first suborbital flight of tourists in a year or two, commercial rockets will soon service the International Space Station, and other competitors are planning visits to the Moon and space hotels. Just a few years ago the idea seemed laughable, but it now looks like space commercialization will soon open the final frontier to private ventures.⁷ As access to space becomes widely available, it's easy to imagine how this watershed from government control to private enterprise could unleash a rush of space pioneering.

GUIDES TO MANAGING BREAKTHROUGHS

Forming a good strategy is inherently an uncertain process and all organizations do it somewhat differently, of course. Box 1 outlines insights from creative companies like Netflix, Apple, and Toyota stay at the cutting edge of innovation. Our consulting work and sound management practices all lead to the following four general principles to effectively guide technology strategy. For more, see www.BillHalal.com.

Experts insights

Box 1 Guides to Technology-Based Strategy

1. Track Strategic Technologies

Online research systems now offer big advantages in the need to track critical emerging technologies and social trends, and to anticipate their likely corporate impact. (see box 1)

2. Develop Creative Opportunities

Trends should be explored carefully to discover creative opportunities for converting disruptive breakthroughs into successful ventures.

3. Involve Stakeholders

Critical knowledge, good ideas, and commitment are gained by working with employees, partners, clients, and other stakeholders.

4. Plan on Both Failures and Success

Failure can offer valuable lessons, and good management can hedge against risk.

PLANNING FOR THE NEXT ECONOMIC UPCYCLE

Our collective forecasts are aggregated to "macro-forecast" the larger economy over the next decade or two. The bubble chart in Figure 2 presents all three dimensions of all forecast data: Most Likely Year, Experts' Confidence and the potential Market Size. This analysis suggests that the Great Recession may linger for a few years, but a new wave of economic growth is likely to take off about 2015.

The period around 2015 is significant because the cluster of green technologies, information systems, e-commerce, and advanced auto designs in Figure 3 suggests a resurgence of economic growth is likely about that time. This also coincides with the pattern of 35 year cycles that roughly govern U.S. stock markets. Look at a 100 year graph of the Dow Jones Industrial Average on a log scale and you will find three 35 year cycles. The Roaring Twenties was the peak of a 35 year cycle that ended with the Great Crash of 1929. The Eisenhower boom of the sixties started about 1945 and was followed by the Reagan boom that began with his election in 1980. The 2008 economic crisis marked the end of the Reagan 35 year cycle, and it is likely be followed by a new worldwide boom starting about 2015 based on the technologies noted above.



As the Technology Revolution picks up speed about 2020, we are likely to see personal medicine, intelligent cars, alternative energy, and the other advanced technologies shown. This period is also likely to enjoy near-infinite computing power with 2nd-generation architectures (optical, bio, nano, quantum). Smart robots are likely to enter homes and offices, and good AI is likely to automate routine tasks, in the same way GPS navigation solved the problem of travelling from point A to point B.

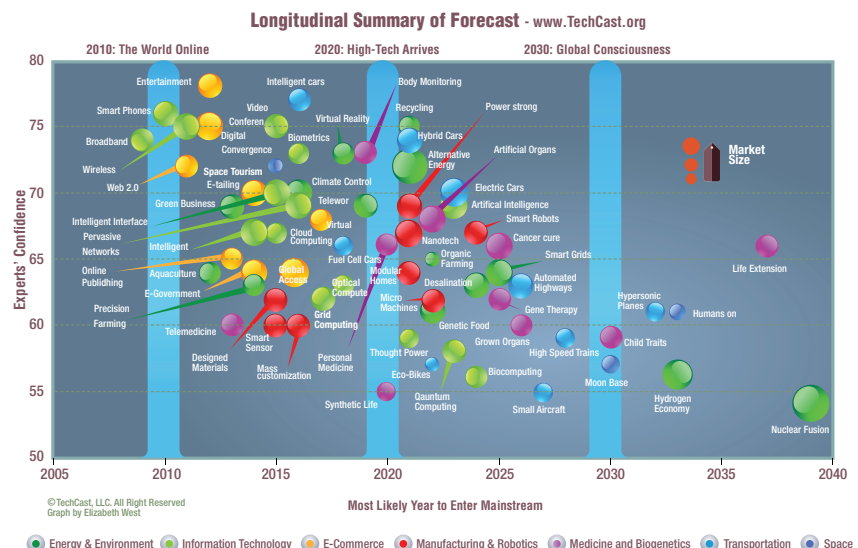
With such bold prospects for innovation likely over the next five to ten years, it is essential to prepare for the Technology Revolution. Whatever the method and whatever the purpose, organizations need to develop some type of well-thought system to forecast and adapt to this

wave of technological change. There may be uncertainty about specific breakthroughs, but there is very little uncertainty that we are going to see plenty of technological change over the planning horizon.

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Figure 2 The Technology Revolution



Creating Successful Industrial Policy

- Towards Decreasing Uncertainty by Combining Foresight, Intelligence and Business Analytics.



BY

Jonathan Calof, Jack E. Smith and Gregory Richards

Telfer School of Management, University of Ottawa
ciprof@hotmail.com

Experts insights

Introduction

Establishing industrial policy and its ensuing programs and industry assistance measures are fraught with high levels of uncertainty. As will be shown in this article, through an integrated program involving foresight, intelligence and business analytics not only will it be able to decrease levels of uncertainty and risk, but these techniques should lead to increasing probabilities of policy uptake by its intended audience and also early identification of industry opportunities.

The authors of this article have been involved in hundreds of industrial policy and program projects around the world. We have seen programs succeed and we have seen far more fail and the purpose of this article is to propose a framework and series of tools designed to increase the chances of industrial policy success. Industrial policy and its ensuing industrial assistance measures, whether tax based or fiscal incentives, is designed for several broad purposes. To simplify this, for the purpose of this article, we will focus on what is emerging as a more common objective or outcome of the industrial policy which is to get domestic companies properly positioned for markets identified as high priority for the country.

Malaysia and Industrial Policy

In past years, Malaysia identified clean technology as a priority market and instituted several policy mechanisms including loan guarantees for eligible clean tech investments. During almost the same period, Russia invested approximately \$5 billion in infrastructure spending and industrial investment in nano-technology. The intent of these policies and supporting programs is to ensure that the domestic environment provides the necessary support for the industry and that the countries' companies develop the appropriate products/services for these markets. For the most part these programs and policies are intended to support the development of industry that will be either regionally or globally competitive. So, for this article we will not focus on industrial policy aimed at strengthening domestic industries selling to only domestic markets but on domestic industries selling in global or regional markets. This is certainly the case for Malaysia in clean technology as the intent of the program is to make Malaysian industry number 1 in Asia in certain clean technologies, not just in Malaysia. In the case of Russia it's about global nanotechnology based product sales. Thus, for this article, the outcome of industrial policy will be defined as regionally or globally competitive domestic firms selling the targeted industry products or services.

Types of Industrial Policy Uncertainty

Developing industrial policy designed to develop innovative, science and technology related industry's is fraught with significant uncertainty. This uncertainty arises for many reasons, from our experience; most of this is due to the fact that governments have very little true control over the program uptake and outcomes. In industrial policy, governments control the program design, its support elements and of course who gets the benefits. But the government does not control who applies for the program, whether the companies accept the program, and other such factors.

For example, when Malaysia launched its clean technology assistance program the government controlled what company investments would qualify for clean technology certification and

whether they would get the loan guarantee and funding. But that is where their control ends.

For a program to succeed, many factors beyond the governments control must, in a sense, cooperate, and therein lies the uncertainty. Below are three types of these uncertainties:

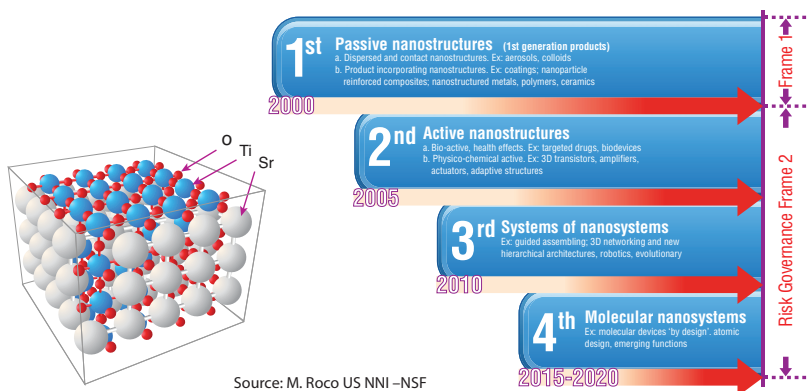
- a. Program uptake uncertainty: For the desired outcome of an industrial policy to arise, the domestic industry players must actually use the mechanism/s and do what the policy is intended to encourage them to do. Think of government policy as a program designed to change organizational behaviours. A loan guarantee program for example is designed to get banks to give loans that they otherwise would not have given out. Investment tax credits for research and development are designed to cause companies to do research in areas that previously they were not aware of or willing to invest in. Conceptually, the program is designed to cause the decision makers (industry) to make the decisions designed to support the government's industrial policy outcomes by increasing the perceived attractiveness of these markets. But while the government does control the level of loan guarantee and the type of tax credit, it is ultimately the bank that decides if they will put the loans out and it is the company that decides if they will do the research and development. Government programs can encourage these actions, but if the companies do not make these decisions, the policy will fail. We have seen many government tax incentives, credits and loan programs around the world fail because the intended targets did not use the mechanisms; i.e. they had no desire or were not yet ready to make the decisions that the industrial policy was designed to support.
- b. Domestic capacity uncertainty. Domestic industry players must have both the ability and the desire to do what the policy intends it to do. In the case of the Russian nanotechnology program the desire is for Russian companies to develop products that are nano enabled. By 2020 the hope is that they will have what is termed level 3 nano products (see table 1 for more on levels of nanotechnology). But even if the companies are interested in moving in that direction (point "A") do they have the

capacity? Do they have the ability? Too many times we have seen government programs specify targets and directions that the domestic industry does not have the capacity to meet within the program policy time frame

- c. Time line induced market uncertainty: Once developed and implemented it takes many years till policies objectives are realized. Meanwhile as the policy is being designed and being implemented, markets evolve at increasingly faster rates, new competitors emerge, new technologies are created, customers' needs change, some markets grow and others die, and so forth. When a government like Malaysia institutes a clean technology program they hope that the technologies it is designed to support are still commercially viable when the companies they are helping are ready to sell them. As it can take upwards of ten years between idea inception and commercialization this creates a lot of uncertainty because there are many factors that can change the industry in that time, and usually none of these are under the control of the Malaysian government (e.g. they have no control over what a company in the United States does in their R&D program or what a foreign government designs as its clean technology policy. For Russia's nanotechnology program one of the support measures was to stimulate the development of nanotechnology university programs. While it takes four years to graduate someone with an undergraduate degree in nano-science, it also takes several years to create the program that will lead to these graduates. Given that the objective of industrial policy is to create future industry success, the longer the timeline between program development and eventual commercialization, the higher the uncertainty is - that by then the environment may have changed significantly. The uncertainty therefore lies in whether the industrial policy and programs being designed today which are designed to affect companies decisions upon program implementation (items a and b above) will fit with the global competitive environment at the end of the program timeline (when the products/services are ready for market). For Russia and nanotechnology the industrial programs are geared towards an environment envisioned in the year 2020.

Experts insights

Figure 1 Four Generations of Nanotechnology



The above only describes 3 of the elements of uncertainty that will impact industrial program success. Foresight, intelligence and business analytics provide important tools for reducing the uncertainty associated with these elements. In this article, readers will be shown how:

- 1) Foresight and intelligence can be used to identify where the industry is going in the longer term. This increases certainty and understanding to look at what areas of the industry to actively support with policy and programs. These techniques will be shown to reduce timeline induced market uncertainty.
- 2) Intelligence and business analytics can be used to identify what instruments (programs and policies) need to be developed and how they should be designed to get industry to move in the direction identified under number 1. These tools will be shown as a method to reduce program uptake uncertainty.
- 3) Intelligence and business analytics will also be used to determine if the program targets are reasonable. This is part of domestic capacity uncertainty
- 4) Finally ongoing foresight, intelligence and business analytics will be linked with the idea of an industrial policy dashboard to help policy makers monitor whether the program is still on track after the program is launched. Ongoing monitoring on the dashboard will result in continued reduction of uncertainties associated with program uptake, timeline and domestic capacity, and provide an early warning system to policy makers so that they will know early enough whether design or criteria changes to the industrial policy are needed.

A Case Example; Applying Foresight, Intelligence and Business Analytics (IFAB)

For the purposes of this article we will use Nutra-pharmaceuticals as the basis for our industrial policy examination for the use of foresight, intelligence and business analytics. The use of nutra-pharmaceuticals is purely for demonstration purposes and is based on Malaysia having active involvement in this sector with an active industry, research and MOSTI's Malaysian Institute of Pharmaceuticals and Nutraceuticals.

Foresight is about the application of collaborative, creative and analytic techniques to ensure longer term visions can be factored into improving short term decision-making. It is a systematic multi-tools and perspectives approach based in science and early signals identification that enhances

anticipatory capacity, examines readiness for change, and develops agility and mechanisms for coping with change to reduce surprise to business, government and society. Foresight is not prediction; - instead, it produces multiple, plausible, contingent scenarios, roadmaps and other directional guides to managing uncertainty by reducing the surprise aspects but not eliminating it.

Most advanced technology-based economies now have developed foresight programs to assist their industries cope with the speed and uncertainties of global competition.

So how for example, might a national foresight organization, concerned about the long term competitive viability of its nutra -pharmaceuticals sector approach the challenges of a rapidly changing technology landscape? More specifically, how should an industry department, already with a successful track record of nurturing the development of new nutra-pharma companies approach the complexity of deciding whether, when and how to invest in a new area of technological progress with potentially transformative applications?

A first step would be to consult technology and environmental scanning reports similar to those categories highlighted in Table 2, below. (Table 2 was developed by organizers of the 2008 European Commission's Future Technologies Assessment Conference overview report on the Big Picture Survey it sponsored.)

The survey uses five standard STEEP- type categories and then three sub-categories for each- with technology areas embedded in each sub area, and/or featured in the two yellow highlighted areas under Science and Technology). These foresight techniques would indicate, for

Table 2 Creating Successful Industrial Policy

Source European Commission FTA Seville 2008			
Society & Culture	Social Norms, Education, Information & Knowledge Society	Demographic, Urbanization, Population Health & Migration	Equity, Ethical, Moral & Legal Issues
Science & Technology	Science Culture & Discoveries	Technology Progress	Innovative, Transformative Applications & Products
Energy	Current Energy Use, Peak Oil, Efficiency & Security	New and Renewable Sources	Non Renewable Energy Alternative (e.g.H2, nukes)
Ecology-Economy	State of Global Finance, Trade, Debt and Related Globalization Issues	BRIC Rapid Development Economies	Climate Change, Global Warning=sustainable ecology, new economy
Geo-Politics & Security	East-West, North-South Issues, Governance, Health of Democracy, Failed States	Global, Cyber Terrorism & Nuclear & Bio WMD	Water, Food and Resource Shortages, Disasters

Source: European Commission FTA Seville 2008

Experts insights

To apply these to our case we first need to determine where we are now in 2012 - where we seem to be heading and whether this can or should be altered, accelerated in some manner through policy actions.

example, that there exist real uncertainties about what applications might soon become both technically feasible and economically viable and whether there may be toxicological risks. Scanning would also indicate that there already is a growing global market in bio-nutraceuticals - and - that the application of molecular scale nano-engineering is progressing fast and could create enormous growth if and when successfully commercialized. Significant uncertainty however remains around which countries and producers could do this when and how.

To better understand the broader context of these uncertainties two additional foresight techniques are frequently employed: scenarios and technology roadmaps.

Foresight Scenarios

Scenarios explicitly build upon identified key uncertainties to develop future oriented situational narrative visions and glimpses of plausible future operating environments that can reveal business challenges as well as opportunities flowing from the resolution of the identified uncertainties - thereby enabling anticipatory actions in advance of one's competition.

For example in the area of future nutra-pharmaceutical applications, here are four representative scenarios that are derived from the dual uncertainties of Science and Technology (S&T) rate of progress, and the pace and performance results of regulatory oversight: what is most apparent is that regardless of whether the performance is uncertain or high, as soon as the dynamic for S&T progress shifts into fast - the result moves into the nano driven zone - a clear alert for technological disruption watchers.

So what messages are the foresight scenarios conveying?

- The current market - 2012 - for conventional pharma-nutraceuticals is projected to remain sluggish but could soon be highly vulnerable if (as expected by leading scientists), nano-scale design and production advances enable producers in other countries or markets to shift into what is described as fast and transformative - a situation that would create a new base for competition;
- There are understandable uncertainties associated with R&D, regulatory approval which will have to be closely monitored - because if the new nano techniques are able to obtain approval then current production platforms will become as obsolete as floppy disks competing against flash drives.
- While timelines are imprecise in foresight, it is clear that key change factors - as represented by the scenario drivers and uncertainties - are going to be influencing the next business cycles of pharma-nutraceuticals - so now it is time to apply technology road mapping and then competitive intelligence techniques.

To apply these to our case we first need to determine where we are now in 2012 - where we seem to be heading and whether this can or should be altered, accelerated in some manner through policy actions.

Diagram 1 Scenario Descriptors: Pharma-Nutraceuticals 2030

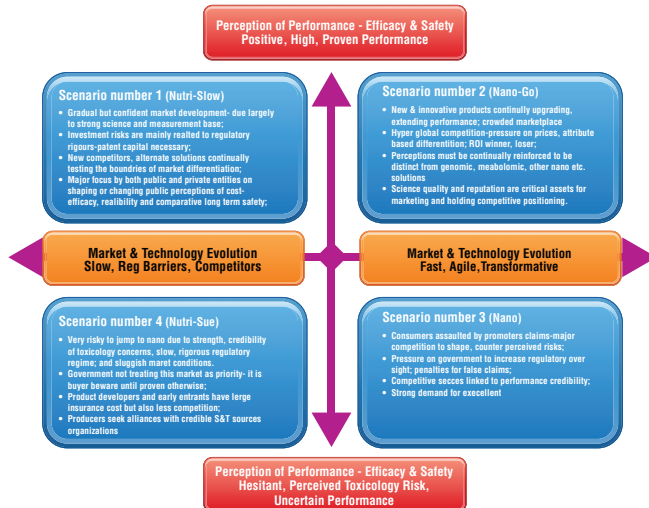
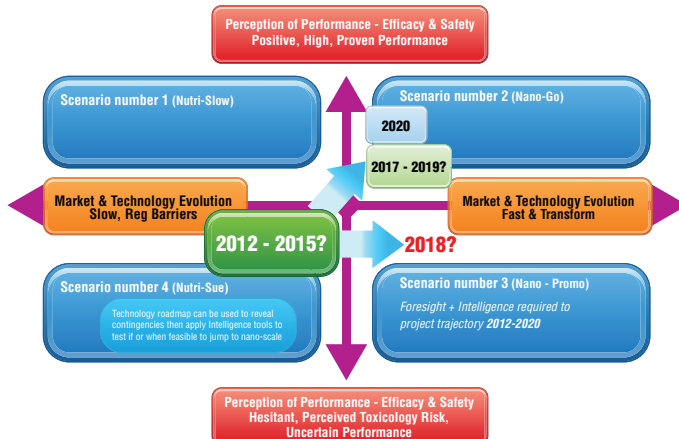


Diagram 2 Scenario Situating: Pharma-Nutraceuticals 212-2030



Technology Roadmaps

More specific to the needs of most business enterprises than scenarios, (which are typically initiated by governments) technology roadmaps are employed to further reduce uncertainty; first by being managed by industry, and second, by having more near-term and specific decision time lines for investment - i.e. What specific investments will be required and when (e.g. new R&D; equipment, training and skills development, emerging market research) to acquire the needed agile capacity to realize the opportunities and to reach the business destination before others.

Experts insights

The TCOS Framework¹ pioneered by the RAND corporation, encapsulates these concerns, where uncertainties associated with Technological, Commercial, Organizational and Social factors must be overcome before an invention will likely become a successful innovation:

The TCOS uncertainties can be regarded as a series of hurdles, but they can also be regarded as potential sources of competitive advantage/disadvantage – i.e. competencies in one area compensate for deficiencies in another. So now let's look at how this example might apply to Malaysia - a country where conventional pharmaceuticals are doing quite well but without much awareness or preparedness at the firm level for disruptive change on the scale that a rapid shift into nano design and production would imply.

Table 3, (developed by one of the authors for a Canadian foresight exercise in 2007) shows, for example, how a generic foresight roadmap might comparatively position - in terms of relative risks (technical, market and policy) - different candidate emerging technologies that involve nanotechnology applied to food and water applications.

We shall illustrate how intelligence and business analytics can be employed to more precisely and quantitatively determine how to choose between the candidates that make it past the initial uncertainty filter of the roadmap which is derived from expert opinion and tends to be qualitative.

1. Technological uncertainty:

- Does it work?
- Relatively non-complex and unambiguous (interacting variables can be identified and outcomes tested)
- Domain of scientists, engineers, e.g. Popperian scientific methodology (conjecture-refutation approach) appropriate

2. Commercial uncertainty

- Is it commercially viable?
- More complex than technological uncertainty, but relatively unambiguous (i.e. market demand can be estimated)
- Domain of marketing, advertising

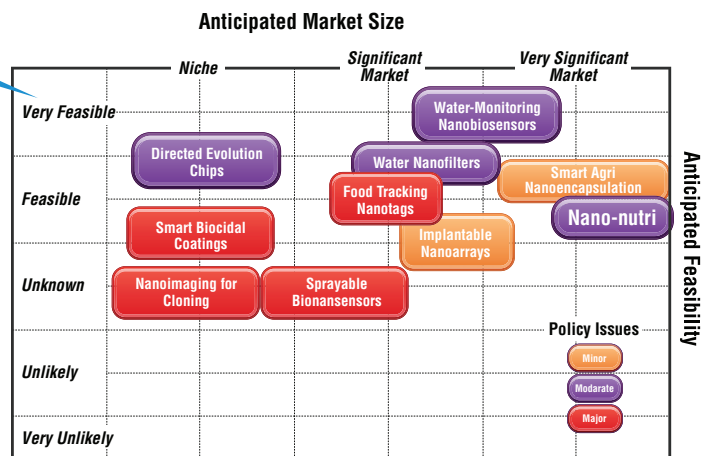
3. Organisational uncertainty

- Can your organisation appropriate the benefits?
- Based on intellectual property protection regime and complementary assets
- Domain of the Strategists

4. Social Uncertainty

- Is it acceptable to civil society?
- Generally most complex and ambiguous (some interacting variables such as secondary stakeholder concerns are often difficult to identify or have disparate goals, demands, opinions and may interpret the same situation differently or emerge after the fact, change when concessions are offered or scientific evidence is presented).

Table 2 Technology Roadmap of Emerging Nano-Food and Water Technologies



Source: Prospective Applications of Converging Technologies Report by the Center for Innovation Studies for the Office of the National Science Advisor for Canada 2007

Conclusion from the same 2007 report:

Table 3 (excerpt from) Analysis of Technology Roadmap 2025 Nano - Bio Candidate Applications

Bio-nano-composite new materials	<p>Biocomposites such as bone combine the strength of minerals with the elasticity of collagen. Adding nanotubes to the mix would enable superstrong, supertough materials</p>	<ul style="list-style-type: none"> - Bio-mimetic / polymer/fabrics - "breakdown" properties maybe critical: need to engineer - Nano-natural materials (bone patch, micelle food additives) - GM already has composites (nano potential) - Nutraceuticals: lots of prospective applications - Molecular diversification for product diversification / nano element (separate) - 2020: do we see any limits on this?
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Experts insights

Subsequently by 2010 we can see that nano-nutraceuticals are already being actively pursued for risk reduction and commercial opportunities:

JANUARY 28, 2010

Nutraceuticals Scientists Quantify Nanoparticle-Protein Interactions

A research team at the National Organization of Standards and Technology (NOST) has quantified the interaction of gold Nano Nutricals and Nano Nutraceuticals with important proteins found in human blood, an approach that should be useful in the development of nanoparticle-based medical therapies and for better understanding the physical origin of the toxicity of certain Nano Nutricals and Nano Nutraceuticals.

Nano Nutricals and Nano Nutraceuticals show promise as vehicles for drug delivery, as medical diagnostic tools, and as a cancer treatment agent in their own right. Gold Nano Nutricals and Nano Nutraceuticals, spheres that vary in size between 5 and 100 billionths of a meter in diameter, are especially useful because of the many ways their metal surfaces can be "functionalized" by attaching tailored molecules to perform different tasks in the body. However, treatments require a large number of particles to be injected into the bloodstream, and these could be hazardous if they interact with the body in unforeseen ways.

* S.H.D. Lacerda, J. Park, C. Meuse, D. Pristinski, M.L. Becker, A. Karim and J.F. Douglas. Interaction of gold Nano Nutricals and Nano Nutraceuticals with common human blood proteins. ACS Nano, December 18, 2009, DOI: 10.1021/nn9011187.

+++ NRC report, "Review of Federal Strategy for Nanotechnology-Related Environmental, Health, and Safety Research," available online at http://www.nap.edu/catalog.php?record_id=12559numbertoc.

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- The TCOS framework suggests positive potential from the new technological opportunities;
- Further R&D will be required, especially in terms of the regulatory hurdles;
- To succeed - or at least to be early entrants into the emerging new nano-based nutra-ceutical design and production platforms will require excellent scientific capabilities and equipment that aspiring firms must plan and recruit for in advance if they want to be competitive.

We leave the foresight section with a clearer understanding of potential emerging scenarios in nutra-pharmaceuticals and the recognition of the need to get Malaysian companies moving forward faster in transformative technologies in this area. In particular, a program is desired to get Malaysian companies developing nano based nutra-pharmaceutical products. Through the road-mapping exercise we also have a sense as to what areas of research and product development will be most important to work on at least from a 10 to 20 year timeline.

Although technology foresight is showing that several pharma-nutraceuticals have already been commercialized, risk nevertheless remains, mainly because the regulatory environment has not yet fully rendered its judgements. Here is an example

of regulatory research that continues to impact the long term horizons for nano-nutraceuticals: The conclusion of the technology roadmaps application is that:

**NANOSCI NANOTECH.
2004, 4, 1–11**

Toxicological Hazards of Inhaled Nanoparticles—Potential Implications for Drug Delivery

Paul J. A. Borma and Wolfgang Kreylinhg at the University of Dusseldorf, Germany and Institute for Inhalation Biology, GSF-National Center for Environment & Health, Munich, Germany:

Nanoparticles (NP), here defined as particles with a diameter smaller than 100 nm, are increasingly used in different applications, including drug carrier systems and to pass organ barriers such as the blood-brain barrier. On the other hand, a large body of know-how is available regarding toxicological effects of NP after inhalation. More specifically, a number of effects of inhaled NP are attributed to their (i) direct effects on the central nervous system, (ii) their translocation from the lung into the bloodstream, and (iii) their capacity to invoke inflammatory responses in the lung with subsequent systemic effects. This paper gives a brief review on the toxicology of inhaled NP, including general principles and current paradigms to explain the special case of NP in pulmonary toxicology. Since the evidence for health risks of NP after inhalation has been increasing over the last decade, this paper tries to extrapolate these findings and principles observed in inhalation toxicology into recommendations and methods for testing NP for nanocarrier purposes. This review recommends a closer interaction between both disciplines to gain insight in the role of NP size and properties and their mechanisms of acute and chronic interaction with biological systems. In this review, we have indicated what effects of NP have been found by toxicologists and epidemiologists, and how this know-how could be used to develop screening for safe NP drug delivery.

Nanosci. Nanotech. 2004, 4, 1–11 Borm and Kreyling/Toxicological Hazards of Inhaled Nanoparticles

A final point important for all readers is to understand the method by which these conclusions were reached. Scenarios, roadmaps and scans are all externally focused. That is it relies on information provided by experts generally outside our organization. A scenario exercise typically brings together dozens of industry participants (company executives, academics, association executives and so forth) not just from our country but from around the world. In a Canadian scenario workshop on Oceans Technology, over 100 people participated, coming from organizations representing 75% of all the industry. In this way information from all portions of the industry and not just government can be integrated in making sound policy decisions. As well, by having this broad a representation of the industry meet and work towards a shared vision, there is better chance of the industry accepting the industrial policy developed and its associated programs. Having industry help in the development of industrial policy in this manner is logical as if they have a role in forming the policy there should be less reluctance for them to accept the program policy and instruments. This leads to a reduction in program uptake uncertainty.

Experts insights

Intelligence – Further Reducing Uncertainty

The Strategic and Competitive Intelligence Professionals Society (SCIP) defines competitive intelligence (CI) as:

“the process of monitoring the competitive environment and analyzing the findings in the context of internal issues, for the purpose of decision support. CI enables senior managers in companies of all sizes to make more-informed decisions about everything from marketing, R&D, and investing tactics to long-term business strategies.”
(<http://www.scip.org>)

The Competitive Intelligence NING, an online community of intelligence professionals further defines it as:

“the interpretation of signals from the environment for an organization's decision makers to understand and anticipate industry change.”
(<http://competitiveintelligence.ning.com/>)

At the heart of competitive intelligence is decreasing environmental uncertainty in the short to medium term by integrating information from various sources and applying appropriate analytical techniques. How does this work for our nutra-pharmaceutical example? There are three shorter term external environmental uncertainties that need to be addressed to create an industrial assistance program that is properly targeted.

- 1) Program uptake uncertainty: What will it take to get the corporate decision makers to invest in nano-neutri-pharmaceutical research? What levers can we use in an industrial program to cause the companies to shift R&D?
- 2) Domestic capacity uncertainty: What specifically are we going to have to support? What stage of development are our companies and infrastructure in?
- 3) Time line induced market uncertainty - While foresight did help to decrease the timeline based uncertainty, nevertheless foresight is not designed for prediction. We have four plausible scenarios and want to get increased certainty on, for example, how fast and transformative science currently is. 10-20 year scenarios and roadmaps provide superb indicative information

for program design but we will have to get a better sense of what is likely going to happen over the next 5 years, a timeline that industry is more likely to respond to.

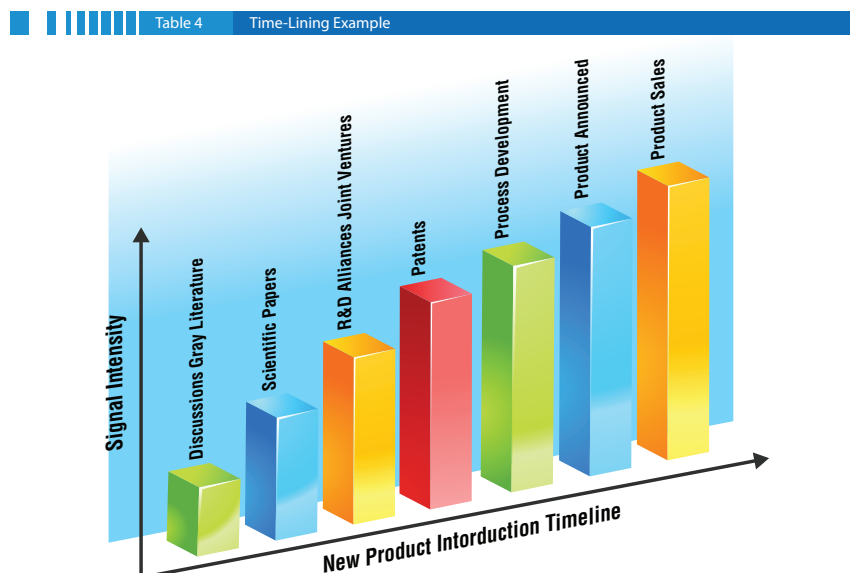
These three areas of uncertainty now form the core of an intelligence program. An intelligence program consists of several key intelligence topics (KITS) that collectively are required to make appropriate recommendations. KITS are external environmentally focused, so similar to foresight, it is very much an outside-in approach. Let's look at two of these KITS.

The industry – the next five years: The first project seeks to gain greater certainty about the drivers of science and technology. How fast is it currently moving? Where is it likely to be in the next 5 years? Where is the industry going? An intelligence practitioner would break this down into a series of intelligence questions or needs and apply appropriate collection and analysis techniques to each. I will highlight two that could be used for this KIT – Time-lining and Back-casting.

Time-lining: Intelligence realized a long time ago that there were logical sequences to any major shift in a marketplace. For example, long before a new technology hits the market there had to have been manufacturing activity, before that testing, before that research and so forth. Each of these sequenced steps leaves information that those interested can view. For example research activities are accompanied with patents and sometimes poster sessions at conferences. Table 4 provides an example of a science based timeline.

It is no wonder that several companies have told employees that when they see someone new at a trade show to let management know. The new player could be a potential customer, competitor, supplier etc learning about the industry. It's an early sign on the timeline. Similarly techniques such as science mapping have been developed to look at what research communities are coming together to better project research direction. Again, an early signal in the timeline. While projecting 10 years is very difficult, time-lining makes things a little more certain by looking at what activities have already been done. The idea then is to identify what is currently happening in the industry at a global level and place it on the timeline. The information is taken from secondary sources such as magazines and various online databases but is also more commonly found by attending industry events. Event intelligence is a growing discipline within intelligence and involves organizing for collection at conferences, tradeshow, workshops and the like to collect this kind of information.

By use of event intelligence it should be relatively straightforward to identify how fast and transformative science currently is and for example, where various companies are at on the timeline. Logically, if nano enabled pharmaceutical is to be commercialized, there has to have been many other activities that precede it. Our job in intelligence is to look at what currently has been done and thereby determine likely directions.





Experts insights

Back-casting: Another version of this technique is back-casting. This works in the reverse of time-lining and asks what activities must have preceded the event we are concerned about. For example, in a recent exercise that the authors were part of in food safety, “fast transformative science and technology by 2020” meant that everyone would have hand held food scanners that were DNA programmed. If that was to happen by 2020, then in a back cast, these devices would need to have been in pilot testing stage by 2015, since it would take at least 5 years to get volumes to the levels where consumers could afford to buy them. For this to be invented by 2015, food scientists estimated that by 2013 at the latest you would have to have DNA coding for a variety of allergens and foodstuffs (which does exist) and a bio-informatics infrastructure that could hold this data (which we currently do not have). For this to occur (the bio-informatics infrastructure) to occur by 2013 would require a research and training capacity in Universities for developing this by 2011 and that had not yet happened. Conclusion – the 2020 scenario had a low likelihood of happening as by 2015 - which were only 3 years away from when the back casting exercise was done - a product would have to be developed which could not happen given the current state of science and technology. One day it will happen, but based on the back casting not by 2020. The conclusion was that the speed and nature of transformative technology based on intelligence gathered and developed today would not be as fast as suggested in that scenario. These two techniques, - time-lining and back-casting help to reduce uncertainty.

Program uptake uncertainty: Let’s assume that time-lining and back-casting have validated the type of research and development that the program will support. Also assume that through techniques such as sentiment analysis (to be described in the next section) and resource gap analysis we have validated that there is capacity and desire in our country to support the program. With domestic capacity certainty and now reduced time line induced market uncertainty it is now time to reduce participant uptake uncertainty – so let’s get them making the decisions that support the program outcome – invest in nano based nutra pharmaceutical research and development. Put another way, how do we change their minds? Here again is where intelligence becomes key, the technique is called

profiling and involves putting together detailed psychological based assessments of the targets for the program. The idea in profiling is to identify all the questions that must be answered so that we can project likelihood of a positive decision outcome. The difficulty in putting together a profile is threefold:

1. Who do we profile: You can’t do detailed profiles on every company in your industry, thus you need to decide which ones are most important to profile. This requires in-depth industry understanding. At a minimum you profile those companies that you know could, if properly motivated, develop the appropriate technology within the program time period. But you need to know your industry participants well.
2. What specifically do we need to know? Given that the objective of the profile is to design appropriate policy instruments that would lead to targeted investments, we would need to be able to gather sufficient data so that we can project the likelihood of the organization investing in nano based nutra pharmaceutical research at a minimum these profiles would need to have items such as how they make R&D and product decisions, the factors that are most important, their targeted returns on investment, risk taking portfolio etc. How will they react to loan guarantee versus tax credit versus straight grants?
3. Where are we going to find this information? Intelligence plans put a lot of emphasis into the collection side; where to find the information and how to collect it. Fortunately for a project like this most of the information required to profile the companies should be readily available to the government. For example, they may have already applied for programs and a check into the program files and discussions with program officers who managed the program would help. Further, as part of the scenario exercise described above for Malaysia, key industry participants should have been invited. While at the event you will have heard from them where they are at in their research, how they make decisions, what they want from government and so forth. Integration of information already provided to the government through meetings, workshops, program applications and consultations from key companies should be readily available to use for development of these profiles. If not, the information will have to be collected by directly interviewing these participants.

“**Fast transformative science and technology by 2020**”

By developing profiles on the key companies, designing the appropriate program then should be relatively straightforward as the concept would be; develop the program that you know (based on in-depth company understanding) will cause them to make the investment decisions needed by your industrial policy.

It is unwise to develop industry assistance programs without this understanding and government cannot simply assume that if they put out a loan guarantee program or tax credit program no matter how generous they perceive it to be, that industry will similarly find it desirable. In the next section, business analytics will be used to further refine this element of program design.

The intelligence examples provided above provide a snapshot into how intelligence techniques can be applied to reduce industrial policy risks and increase the probability of program success. The examples have been used to understand the likely direction of the technology environment and the behavioural profiles of the targeted companies. However it can also be used to understand customers, competitors, other governments, suppliers and other elements of the environment that are important to understand for industrial policy program success.

Experts insights

Business Analytics

Business analytics is currently in vogue as a buzz word for the use of data to inform decision making in organizations. In its current incarnation, it is tied closely to the use of data mining techniques to analyze what some refer to as "big data"—large complex data sets that might provide insights if mined properly. In reality, business analytics has been used in organizations for many years, and hundreds of different techniques are available—all focused on optimizing one or more organizational outcomes.

How does business analytics play into the scenario discussed above? If a policy initiative is to encourage businesses to invest in nano-nutra pharmaceuticals, a variety of analytic techniques can be used to anticipate the actual take-up of the provisions of the policy. We'll discuss two relatively simple techniques to illustrate the integration of foresight, competitive intelligence and business analytics within the context of national policies.

Two aspects deserve consideration: estimation of the expected value of the policy and evaluation of the likelihood that participants who are expected to avail themselves of the policy will behave in ways that will provide the expected value.

Recall from the intelligence section, company profiles were used as a basis to determine what types of programs would cause the intended behaviour. In this section we refine this and further reduce program uncertainty but use of econometric models. These models will be applied to understand consumer behaviour (the eventual customers of nano based nutra pharmaceuticals) and the likelihood of companies accepting our policy instruments to encourage appropriate nano based nutra pharmaceutical research.

Econometric models are typically used to estimate the social and economic benefits to be derived from a policy. But the models rely on

data gathered from stakeholders related to the policy environment. One relatively new approach to gather data is "sentiment analysis". This approach, based on analysis of qualitative information appearing on millions of websites and blogs from the intended audience helps to identify opinions related to the outcomes being promoted by the policy. In addition to forecasting techniques such as scenario planning and roadmaps, sentiment analysis can provide guidance as to the attitudes prevalent in a particular population. It can be used for example, to predict the expected take up of provisions of the policy. Assuming that expected policy outcomes include the launching of businesses developing nano based nutra-pharmaceutical products, analysis of consumer sentiment can provide clues of potential customer acceptance. In addition, government policy makers can anticipate how the businesses they expect to participate in the initiative will make their own decisions using business analytics. For example, if banks are to honour loan guarantees, they will evaluate the risk associated with the loan. Loan risk algorithms have been developed by many banks that can be used by the policy makers to simulate banker behaviour related to the policy. With this information in hand, we can go one step further and simulate the decision process used by businesses who might take advantage of the loan guarantees. Businesses typically invest in new products in order to turn a profit. Investment decisions can be quantified through the use of a variety of analytic models, one being the "net present value" calculation. This approach discounts future expected cash flows of an initial investment to estimate potential returns. The calculation is as follows: $SI - \left[\frac{SR}{(1+i)^t} \right]$ Where SI =initial investment, SR =expected returns (cash flow) from sales of the product, i =expected interest rate during the time period, and t =# of compounding period. As a practical example, supposed the business would need to invest

\$400,000, but, based on a loan guarantee from the government, banks would advance a loan for half of that amount to be paid back at a preferential interest rate at some point in the future. The company estimates cash flows for the first 3 years after full production of \$100,000, \$150,000 and \$250,000.

Assuming a 6% interest rate (added to the principal investment amount), the NPV works out to: \$469,931-\$437,743 (discounted cash flow) for a total of -\$32,188. With the loan guaranteed by government, assume the interest rate charged on the loan is reduced to 3%, the cost of the loan added to the \$400,000 investment is now \$432,358 leading to an NPV of +\$37,573. The decision rule for NPV calculations is to invest in projects with a positive cash flow (realizing that the decision maker might have a number of projects with positive cash flow).

Ultimately, using the formula to simulate a business person's decision model can help policy makers to better predict uptake and more accurately define the parameters of a policy. The data used to establish sensitivities around this model will have come from the intelligence profiles developed earlier.

Government policy makers can anticipate how the businesses they expect to participate in the initiative will make their own decisions using business analytics.



Experts insights

Sentiment analysis can also be used as a long range scanning tool to anticipate when changes to the policy framework might be needed. What does this approach do exactly? Tools such as IBM-Cognos Consumer Insight (CCI) will gather millions of comments (facts and/or opinions) from websites, blogs and tweets. Using a combination of Natural Language Processing and Artificial Intelligence, CCI will extract combinations of words from the various sites and "score" the comments so to speak as positive or negative. The program can also create clusters of opinions based on criteria established by the analyst. Therefore, CCI can cluster and score opinions by the banking, business and consumer sectors providing insight into the evolving sentiment in these 3 groups important to the policy.

Business analytics therefore has supported the intelligence developed earlier and served to further reduce uncertainty by providing the ability to process millions of pieces of information contained in blogs and other discussion sites on the net and by providing tools to model likely investor behaviour based on sophisticated algorithms.

Tracking Policy Effectiveness: The Integrated Policy Dashboard

Up to this point, forecasting, intelligence and business analytics have been shown as key tools useful for reducing industrial policy design uncertainty and increasing the probability of its success. But the use of these tools does not end with the development and implementation of the policy. These tools can also be used to create an "integrated policy dashboard". Such a dashboard can help reduce uncertainty during the implementation period by providing up-to-the-minute information on the outcomes of the policy. But forward-looking information can also be integrated...i.e., the long range scanning information discussed in the previous section.

What is a dashboard and how do you develop it? A dashboard is a display of key performance indicators that help institutions steer their activities towards their declared strategic outcomes. To develop a dashboard, we first

clarify objectives, define related measures, and then define what you do with the measures.

Many different structures are used for dashboards. The model depicted in table 5 defines inputs, outputs, intermediate and ultimate outcomes: a well-known planning structure in governments. One of the benefits of the dashboard is to alert policy makers about performance against objectives, but also to identify the factors that influence those objectives. The colour scheme in is based on variance analysis (actual versus target). If actual results are on (or better than) target, the dashboard returns a green. Yellow normally indicates 10-15% off target, and red is returned with actual results are off by more than 15%. Obviously, any number of different structures can be used for a dashboard; table 5 is a simple example to illustrate the use of such a tool for tracking policy effectiveness. An important point to realize about the dashboard is that it too provides an occasion to use business analytics tools to better understand policy performance. In this case, we would be using causal models to define the drivers of outcomes that we seek. We can see for example, that a time lag exists between "advice and counselling" (referring to the number of people who have sought advice on the program) and applications. One period after advice and counselling goes from yellow to green (meaning that we are on target), the number of applications goes green. This might be strictly coincidence, but depending on the type of data available, the relationship can be tested through regression modelling or a myriad of non-parametric techniques. In addition to the business analytic elements of this dashboard which arises from analysing a myriad of data contained inside the government and on the internet (for continued sentiment analysis), we could add information obtained on a continual basis from the intelligence effort. For example, when our employees attend industry events (e.g. tradeshows, conferences and workshops) they would continue to update the profiles on the companies, the technology roadmap and the technology driver analysis described in the intelligence section.

For example, each year Malaysia sends a delegation that includes government officers to the Bio International Convention in the United States. This is the largest gathering of biotechnology practitioners in the world and

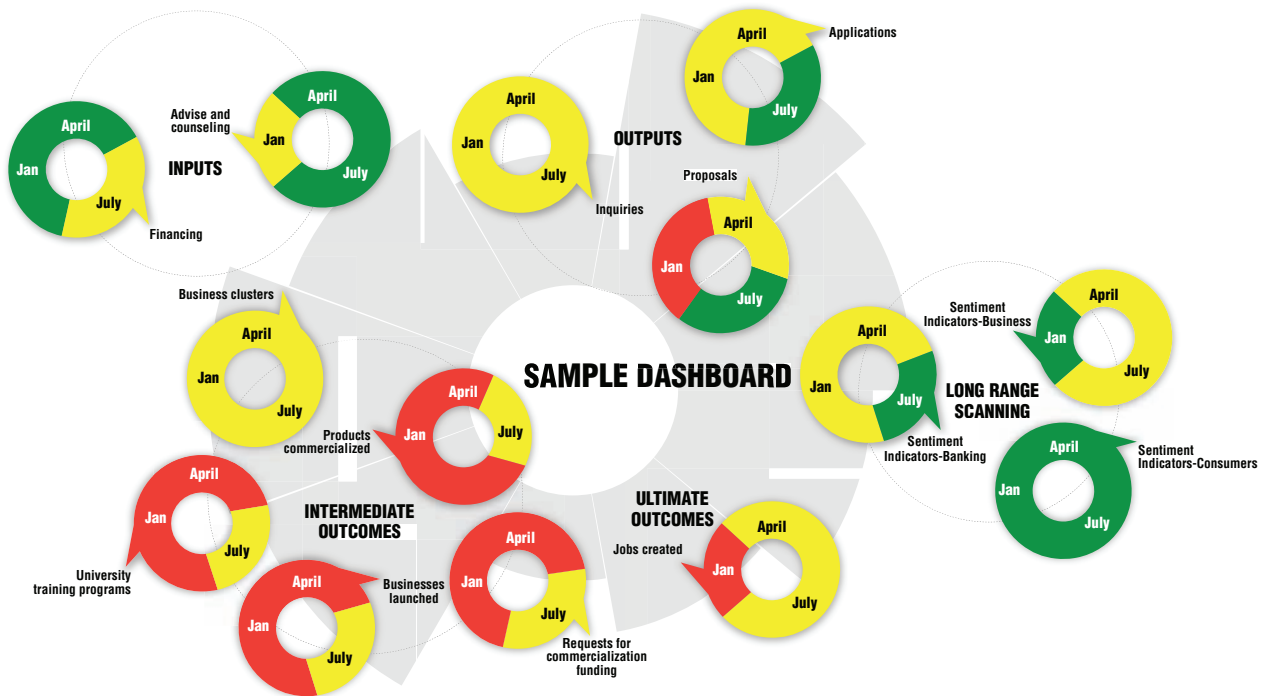


includes some 50,000 delegates from around the world. 125+ educational sessions, over 1800 exhibitor booths, dozens of government booths, and various presentations. An event such as this one provides opportunity to find out what other governments are doing in their nano based nutra pharmaceutical programs, where the industry is at in terms of the roadmap and also how fast science and technology is evolving. It provides information on where the industry is at today and what research is being done today. By integrating information from events such as this within the context of a dashboard it becomes possible to identify if the initial assumptions made in the development of the industrial program in terms of type of technology needed, where the industry is going, what other governments are doing and so forth is still correct. Changes noted either through event mining, sentiment analysis and other such techniques then provide the early warning needed to determine if the industrial policy is on track or whether it needs to be changed. For example if the speed of transformative science and technology appears to be speeding up at the global level, additional funds may need to be allocated to speed up development in Malaysia.

The program dashboard can therefore be used to reduce timeline induced market uncertainty by integrating real-time information on market developments obtained both from external sources (e.g. events) and internal sources. Program uptake uncertainty is also monitored on a daily basis to identify if program targets are being realized.

Experts insights

Table 5 Sample Dashboard



Conclusion

Industrial policy is fraught with uncertainty due to its reliance on external environmental elements for its success. Foresight, intelligence and business analytics taken together provide the toolkit to better understand this uncertainty and can help lead to more successful industrial policy. This is especially important in today's industrial environment where activities arising outside your country can impact technology directions, market attractiveness and so forth. Foresight and Intelligence with their external environment focus provide the tools to among other things understand the direction markets are going in, profile your local industry to determine what policy instruments can work on them, and better understand how technology is going to evolve. Signals picked up today through an externally focused intelligence effort can be used to confirm conclusions reached in longer term foresight initiatives such as scenarios, roadmaps and scans thereby providing the information needed to establish the longer term oriented industrial policy needed in science and technology related industries.

As has been shown in this article, you need to understand the environment of tomorrow to

develop the industrial policy of today as the products and services that domestic companies will launch as a result of the policy have to match the needs and realities of the market at the time of product/service launch. Not the needs and realities at the time of industrial program launch. In many cases the difference between these two (product/service launch vs. industrial program launch) can be ten or more years.

This article has also shown how through foresight exercises, intelligence and business analytics it is possible to learn enough about the targets of the intended industrial policy (e.g. the companies that are to use the loans, or tax credits etc.) so that the right level of incentives can be set to encourage the companies to commit to the policy direction.

Finally, dashboards which use a mix of internally generated information arising from company program requests and interactions with the department coupled with externally gathered information such as from blogs, wikies and conferences can be used to identify if the program is on target long before problems can arise. These sources integrated into a dashboard so that in real time the Department or agency can identify

- 1) If the projected industry direction (e.g. Market demand, speed of technology development) is changing – thereby reducing timeline induced market uncertainty;
- 2) How the intended targets (local companies) are using the program, what issues they are having with it, questions they are asking etc- thereby reducing program uptake uncertainty.

These techniques and the kind of dashboard being suggested in this article give decision makers the information they need to better align industrial programs and policies with the realities of the local (Malaysian), regional (Asian) and international environment.

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Cover story

FUTURE RAIL 2030: Shaping the Future of Malaysian Rail Industry



BY
Mohd Nurul Azammi
Deputy Director
National Foresight Institute
azammi@might.org.my



I.M. Nasir
Senior Principal Analyst II
Head of Rail Industry, Industry Intelligence & Foresight
imnas@might.org.my

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Background

Future Rail 2030: The National Rail Industry Roadmap is a joint initiative between the National Foresight Institute (NFI), an organisation under Malaysian Industry-Government Group for High Technology (MIGHT), and Land Public Transport Commission (SPAD) to chart the way forward for the rail industry development in Malaysia until 2030. The initiative is timely for Malaysia as there is an increasing concern globally on megatrends such as climate change, urbanization and population growth, congestion, oil scarcity and hike of energy price, to name a few. The debates on these trends have created a strong feeling that rail is going to be an important mode of transport in the future.

The rail industry in Malaysia is currently small in terms of rail track networks and number of related organisations although its operation started way back in 1885. Lack of a clear policy, vision and direction of its development has been one of the major factors contributing to the current state of the industry. The Government of Malaysia has invested more than RM50 billion in rail related equipment since 1990s and the number will continue to grow until 2020 through committed investments under Greater Kuala Lumpur initiative of Economic Transformation Programme (ETP). Therefore, local rail support industry must leverage on upcoming investments to strengthen required capabilities for future sustainability. "A journey of a thousand mile begins with a single step" (Lao Tzu); nevertheless, there is a need to pull and consolidate all fragmented hopes and wills of stakeholders to revitalise the rail industry in Malaysia.

SHAPING THE FUTURE OF MALAYSIAN RAIL INDUSTRY

Foresight methods – namely road mapping, were used in developing the plan which generally answers three (3) major questions: (1) Where are we now? (2) Where do we want to go? and (3) How can we get there? Scenario building process was used in answering the second question.

All related parties (Government, Industry and Academia) were consolidated through a structured process to produce a consensus view on desired state of Malaysian Rail industry in 2030. A series of workshops, which consists of more than 50 participants from various organisations, had been conducted to identify 15 drivers that will shape the future of the local rail industry. However through consolidation, only nine (9) drivers of change were selected as follows:

- i. **Policy and Institutional Framework.**
Similar to other industries (such as aerospace and maritime), rail industry involves cross-ministerial/agencies. There is need for a mechanism to effectively coordinate, facilitate and monitor the growth of the industry based on consensus vision, goals and development strategies at national level.
- ii. **Technology and Human Capital Development.**
It relates to current and future workforce that will be supporting the local industry development. Apart from manpower, technology is one of the critical means to ensure sustainability and competitive advantage of the industry in the future.
- iii. **Multimodal and Integrated Transport.**
It is about enhancing efficiency of national transportation leveraging on rail



networks and its advantages. This can only be rationalised through an integrated arrangement and system for movement of passengers (multi-mode of public transportation) and cargos (integrating airport – seaport – ground transportation).

- iv. **Market Competition and Value Added Products / Services.**
Survival of local players to face intense competition in the same playing field with other established international competitors from both domestic and global rail market. The need to grow sense of innovativeness and climb up in supply chain to produce high value products.
- v. **Connectivity and Tourism.**
Train as a preferred mode of transport by the public is also affected by the available connectivity. In Malaysia, it is just an option but not in other developed countries where it has become a necessity.

vi. Safety and Security.

Train is a medium used for transporting a mass number of people and goods which involve high risk, either due to external factors e.g. terrorism or internal factors e.g. derailment, collision. Nowadays, train is getting faster than before and able to reach more than 350 km/hr which requires reliable systems in place.

vii. Localisation and Globalisation.

The growth of the industry is fuelled by a number of business opportunities secured in domestic and global market. Sizable investment has been made by the Government imposed the element of local content. There is a need to develop local capabilities and reduce heavy dependency on foreign products for future sustainability.

Cover story



viii. Sustainability.

As energy scarcity continues to dominate the discussion around the globe (so as climate change due to green gas emission), urbanisation growth proportionate with the increase in population and congestion in cities. These are megatrends that will affect the existing policy and sentiment of people to move towards greener alternatives.

Development, Multimodal & Integrated Transport, Market Competition and Value Added Products/Services and Localisation & Globalisation. Each of these five (5) key drivers forms a main framework to develop a desire scenario (best case scenario). The remaining drivers other than mentioned above will be a part of the narration wherever it is related.

and maintenance, repair and overhaul (MRO). Development opportunities were identified in terms of capabilities enhancement, technology development, potential market and critical skills required by local workforce. Strategies and key initiatives were developed and later tested against the above scenarios.



viii. Geopolitical.

The idea of Trans-Asia networks will give a significant impact to the way current logistics are working. Malaysia as a part of the network need to prepare itself and capitalise on potential opportunities resulted from this initiative.

Through the process of cross-impact analysis, the highest influence among the drivers rated by the workshop participants are Policy and Institutional

THE WAY FORWARD

Beside the above "Best Case Scenario", a list of potential surprises were identified that could become the wild cards or lead to other alternative futures. Subsequent to the scenario building workshops, the stakeholders were grouped based on major composition of the rail industry – rolling-stocks, signalling & train control, electrification, rail tracks and infrastructure, human capital development

In order to finalise the plan as well as to facilitate the implementation of the key initiatives, a committee known as Future Rail 2030 Committee was established. It consists of selected representatives from major rail operators, manufacturers, MRO services, related Government agencies, academia and regulators. The roles of the Committee among others are to provide strategic advice, monitor the progressive achievement of the roadmap recommendations, and share of information on the latest and future rail related initiative.



Cover story

Scenarios of Key Drivers

• Policy and Institutional Framework

In 2030, a total of RM180 billion worth of new rail infrastructure was invested by the Government since it was announced by the Chairman of SPAD in 2012. This explains the Government's commitment to provide the best rail transportation service on par with other developed countries. Recently, the regulator unveiled additional upgrading and expansion programmes of existing networks that will improve accessibility and capacity in several destinations for both passengers and cargos.

In order to support the growth of the industry, the Government through SPAD has developed and adopted set of rail standards. This was resulting from past joint initiative with Standard Malaysia and SIRIM. These standards are applied to strengthen the technical specifications which are currently being used in various procurement exercises. To date, there are already technical specifications developed by the regulator for different type of rolling-stocks e.g. light, heavy and high speed rail. As a result, all new systems, equipments and components, regardless of which operator owns them, are common in terms of technical specification. The remaining legacy assets that are still mixed of standards and specifications will go through refurbishment and upgrading program.

Road-mapping initiative back in 2012 has provided a clear vision, direction and laid down various programmes for the implementation of the key initiatives. To date, more than 90 per cent of the recommendations have been implemented. This is due to an effective coordination and implementation by a central organisation through the National Rail Industry Council. All programs or proposals which are successfully implemented have been supported by various ministries, Government agencies with active participation by the industry and the academia.

• Technology and Human Capital Development

In 2030, Malaysian rail industry has expanded from about 50 to more than 100 related organisations. In addition to the growth of the industry, a sizeable investment made by the Government has also created huge job opportunities for Malaysian workers. High technology, sophisticated, and sleek design of current trains compared with the past 20 years has presented a new image to the public. These will serve as "feel good" factors that largely drive a huge number of young graduates of today to choose a career path in this industry. Besides, the attrition rate will remain very low for a long time as workers tend to stay in the industry when it is being constantly fuelled by a wealth

of projects. Nevertheless, migration of local experts to abroad is something that is inevitable. An outpour of job openings in Middle East requires various types of manpower with different levels of skills to fill vacancies urgently. This has not detriment the industry, instead Malaysia has been exporting the skilled manpower all over the world.

In ensuring sufficient supply of workforce in the industry, there are several skills training institutes established by the Government that continuously produce semi-skilled workers. This is on top of training institutions which are owned by major train operators. A look at white collar jobs show some universities are offering rail engineering as an optional major for final year and as full course post-graduate studies at Master and PhD levels respectively. However, there are avenues for graduates in general engineering fields who are interested to find jobs in the rail industry as well as opportunities for semi-skilled workers keen on furthering studies at a higher level within the same gamut. The Centre of Excellence for Rail which came into fruition from the enhancement of a training institute under KTMB back in 2013 has provided such an avenue for industry hopefuls. It is equipped with the latest facilities and provides students with the most updated knowledge on train technologies which are recognised by most of the global rail companies and associations. This is achieved through continuous

All related parties (Government, Industry and Academia) were consolidated through a structured process to produce a consensus view on desired state of Malaysian Rail industry in 2030.

partnership with foreign technology providers and experts from various rail organisations in Malaysia. All of the syllabuses used are reviewed by a panel of experts in order to ensure that they meet the current and future need of the industry.

The technology development initiative since 2012 has not yielded many discoveries through research and development (R&D) activities. However, new technologies have been acquired through a procurement mechanism called Offsets and reverse engineering. Almost all of the procurements endeavoured by the Government with a total value at RM180 billion imposed the offset program as a mean to

expedite the industry growth and further to achieve the aims as stated in the national rail industry development roadmap. Local rail industry players and operators enjoy the healthy benefits derived from the Government investment programs. Besides that, offsets also result in several joint technology development projects between local universities, local industry players and foreign technology partners on certain key areas. Correspondingly, reverse engineering ventures have been undertaken on critical parts. Funding for R&D is not an issue as it is now being allocated and coordinated under National Science & Research Council (NSRC) which also registers rail-related technology development under one of the R&D priority list. Some of the technologies acquired have contributed towards the improvement of energy efficiency, speed and comfort, interoperability, as well as enhance the reliability of current rail operation.

• Multimodal and Integrated Transport

In 2030, the rail networks that are formerly converged within Klang Valley have expanded nationwide to cover other states in Malaysia. Upgrading and adding lines from the main trunk of KTMB tracks from north to south have now stretched from west coast to east coast of Peninsular Malaysia. There are also a number of spur lines that connect major ports with major industrial parks in East Coast Economic Corridors (ECER), the North Coast Economic Corridors (NCER) and Iskandar Malaysia in the south. Parallel to the existing trunk line, high speed rail which is operated by a private company is fast gaining popularity. Currently, the train is serving Singapore – Johor – Kuala Lumpur route and it plans to expand up to Bangkok. Based on rapid urbanisation progress especially in Selangor, Johor, Penang, Melaka, Perak and Negeri Sembilan, the intra-city or light rail networks soon start to face the same situation as Klang-Valley fifteen years ago. In East Malaysia, there are also on-going projects developing railway tracks in Sarawak and expansion of existing tracks in Sabah. The train will be a medium to transport raw materials for energy sectors and passenger transportation especially for eco-tourism.

The idea of "seamless journey" which seems to be almost impossible to implement in the past has now become a reality. The train has been conveniently integrated with most public transportations such as buses and taxis linking all major hubs in Peninsular Malaysia. Today, a passenger is able to swiftly travel from one destination to another, even embarking on trains by different operators with the purchase of only one ticket or using a dedicated travel prepaid card (subjected to conditions). This facility is now expanded to other states in Malaysia outside Klang Valley. The Government investment on upgrading



Cover story

Similar to other industries such as aerospace and maritime, rail industry involves cross-ministerial/agencies and is need for a mechanism to effectively coordinate, facilitate and monitor the industry growth based on consensus vision, goals and development strategies at national level.

and expansion of rail infrastructure has changed public perception and preference on train over other types of transportation. This is largely due to improvement in punctuality, comfort and duration taken to reach a destination.

Apart from passenger transportation, rail freight has made a significant impact on being the choice of businesses to transport massive cargos to their final destinations. The effective cargo distribution benefits wide upgrading and expansion undertaken by the Government in the previous decades. Raw materials, customized cargo containers, semi-finished and finished products can be transported from various seaports such as Port Klang, Port Tanjung Pelepas, the Kuantan Port, the Penang Port as well as major airports in the country. All of these will have been impossible to achieve had it not been for the efficient clearance process by the Royal Custom. In anticipation of this, Malaysia will have gradually become the preferred regional distribution hub for freight transported from eastern and western regions.

- **Market Competition and Value Added Products/Services**

The year 2030 witnesses upgrading and building rail infrastructure activities mushrooming worldwide, driven by the need to address rapid urbanisation in major cities (such as in China, India and Middle-East), climate change, congestion, to name a few. Malaysia is not excluded from this trend as a sizeable investment in rail has been committed by the Government of Malaysia since 2012 to stretch a span of two decades to enhance the social and economic activities in the country. A number of rail projects in the pipeline has lured local and foreign rail

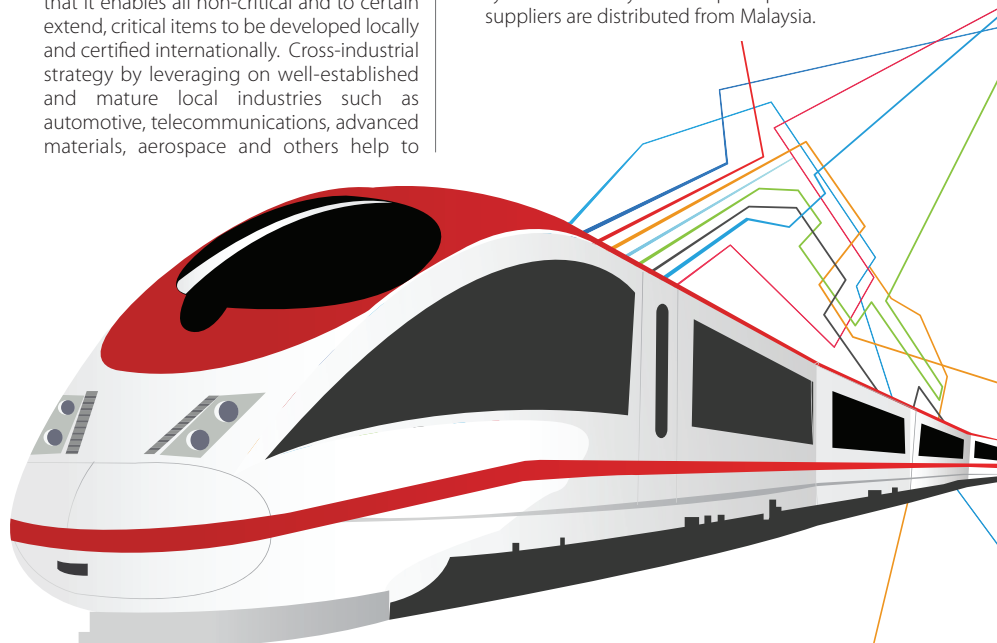
suppliers to bid a piece of the contracts. Flashback to fifteen years before, intense competition is seen only among foreign suppliers where local industry players have almost no chance to compete directly due to unattractive track record, limited capability and product credibility. Today, the situation has changed. Local champions identified, groomed and developed for the past 20 years have positioned Malaysia as one of the respectable competitors in global rail market. Strong grasp over design & development and system integration capabilities have enabled local players to enhance their products competitiveness and support life-cycle of the asset more effectively. The local rail industry widened its offering from monorail to heavy rail products has successfully secured contracts in South East Asia, Brazil, India and Middle East as it is dubbed to have 'Japanese quality, China price'. In view of this, most of the recent contracts tendered by the Government are awarded to players either for new purchases or refurbishment of existing assets. Track records are no longer an issue and the competitive advantages are due to its cost, quality of products and after sale services. Even more important is the multiplier effects to the country's economy as well as achieving national aspirations.

- **Localisation and Globalisation**

In 2030, the Government's enforcement on local content in the procurement of rail assets has yielded positive impact to long-term industry development. Although a small percentage has been committed during the previous procurement back in 2010, the strategies employed since then have generated significant increase in figure from 5 to 10 per cent to more than 40 per cent today. The identification of strategic areas to be developed through road mapping exercise in 2012 have been fully completed that it enables all non-critical and to certain extend, critical items to be developed locally and certified internationally. Cross-industrial strategy by leveraging on well-established and mature local industries such as automotive, telecommunications, advanced materials, aerospace and others help to

further expedite the growth of the rail industry. Besides that, initiative to enforce common technical specification and adoption of dedicated standards have an impact in terms of creating critical mass of rail components which indirectly justify local players especially small, medium enterprises (SMEs) to invest or diversify in this business. Moreover, the situation has mitigated trade imbalance where the export has moved slightly above than the import figure. Most of MRO activities are no longer carried out by train operators, instead by a third party to improve train availability. Recent study showed that serviceability of train operation is at more than average of current best practices around the world. Local MRO players have expanded its ability to fully perform Level 3 maintenance and to certain extend modification, upgrading and testing without intervention from OEMs. Malaysia is now being one of the authorised maintenance centres in the region certified by most top train producers.

In view of pressure being cost effective and high demand of rolling-stocks in Asian region, western train and equipment manufacturers were searching for a suitable location to setup their new production line. Apart from cost and market driven, easy access to pool of skilled workforce, raw materials, IP protection, strong IT facilities and being geographically strategic have tremendous influence on selection of the location. Malaysia fulfils most of the criteria especially being located at the heart of South East Asia, thus making the country one of the attractive destinations for investors. Furthermore, the Government have launched target FDI on selected foreign rail suppliers to fill the critical gap in the local and regional supply chain. Today, most of components, parts and systems made by world top rail producers/suppliers are distributed from Malaysia.




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Industry insights



Towards Green and Sustainable Aeronautics

National Aerospace Blueprint (1997)

which emphasized on the importance of aerospace industry towards the globalization and on the value chain of production

Aerospace Malaysia Innovation Centre (AMIC),

A standing research institute of excellence which established in November 2011

Industry insights

Global oil consumption increases from 85 million barrels a day in 2006 to 118 million barrels per day in 2030.



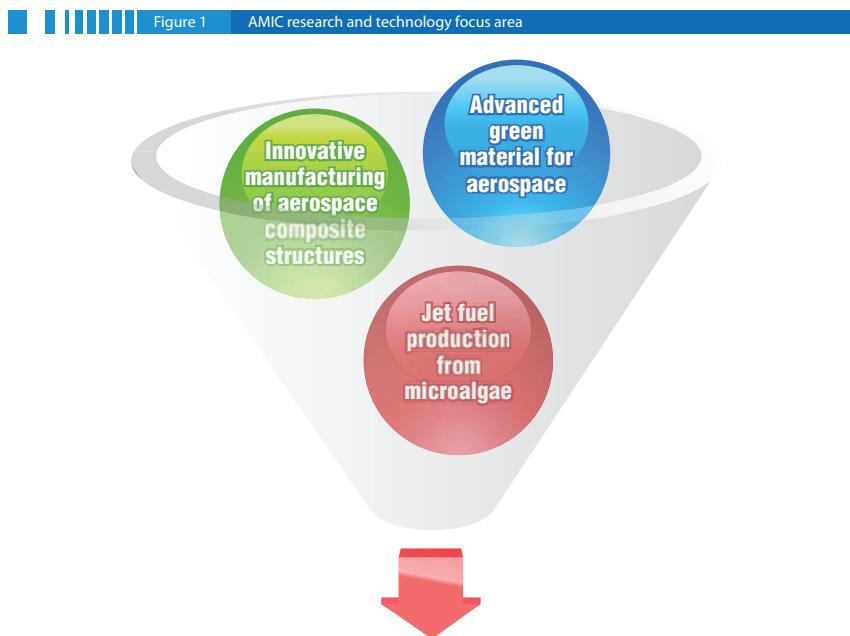
BY
Abd. Rahim Abu Talib, Ph.D
 Chief Operating Officer
 Aerospace Malaysia Innovation Centre (AMIC)
 abraham@amic.my

NASA AMES
 Research Centre
 put up challenges for
 green aviation and focussed
 on the environmental
 impact of aviation

Overview

Awareness regarding the need to have a sustainable future has been discussed and debated in many international forums among the government agencies, non-governmental organisations as well as private industries. Many initiatives have been planned and implemented in the past decades to ensure the modern development in high end technology will lead to a sustainable way of life in the context of social, environment and culture. Aerospace industries in particular have played a major role in contributing to the fast development in today's modern life. The direct and indirect impact from the aerospace industries, along the value chain from processing raw materials, design, fabrication, manufacturing, assembly, installation, application, and maintenance until the end of life of the components, does play a role in affecting the modern development. Green Aviation Summit 2010, organised by NASA AMES Research Centre, put up challenges for green aviation and focussed on the environmental impact of aviation. Noise and emissions reduction, fuel burn reduction, alternative fuels and environmentally friendly airspace operations were among other issues being discussed and presented.

Aerospace Malaysia Innovation Centre (AMIC), a standing research institute of excellence established in November 2011, is actively focusing its efforts on the three areas which have been labelled as 'research roadmaps' in order to tackle some of the current most important challenges and helps to set up the pathway for the future aerospace industry. These research areas consist of jet fuel production from microalgae, innovative manufacturing of aerospace composite structures, and advanced



green materials for aerospace (Fig. 1). Continuous and dedicated research in these fields will provide AMIC with an international recognition of its expertise in working towards sustainability of the aerospace industry

Since the launch of the National Aerospace Blueprint (1997) which emphasized on the importance of aerospace industry towards globalization and on the value chain of

production, Malaysia has a clear pathway towards a sustainable future in aerospace industry through highly competitive research activities. AMIC is a unique research innovation centre that assists researchers in the industry and universities to expand and potentially be the benchmark for the whole wide aerospace research in near future. This article will provide a brief overview of AMIC initiatives towards green and sustainable aeronautics.

Industry insights

Jet Fuel from Micro Algae

The Need for alternative to Fossil Fuels

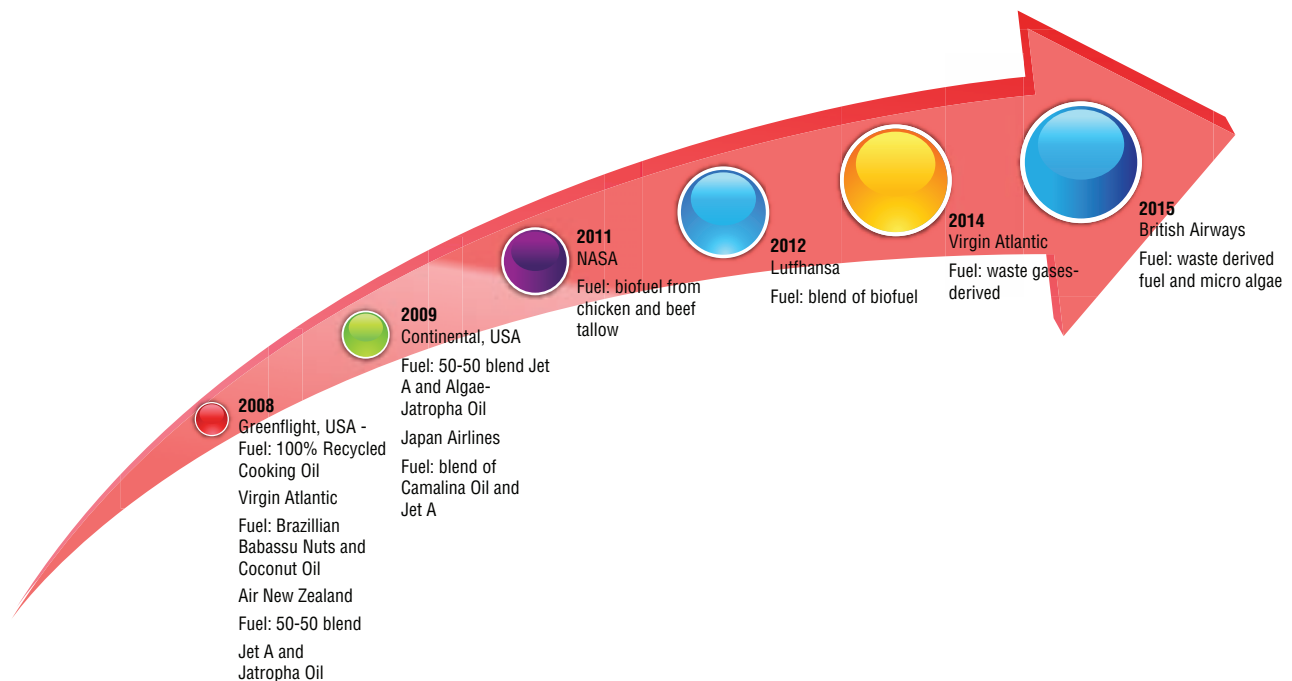
There is a general consensus within the literature that fossil fuel feedstock used for the production of aviation-grade kerosene fuel are dwindling. Koh and Ghazoul (2008) expect a peak in oil production scenario within the years 2010-2020, assuming that global oil consumption increases from 85 million barrels a day in 2006 to 118 million barrels per day in 2030. Nygren et al. (2009) projected that civil aviation traffic growth

will increase at a rate of 5% per year, while fuel consumption will increase at 3% per year. Lee et al. (2009) however projected that aviation traffic growth will increase by 4.5% to 6% per year over the next twenty years, with traffic doubling every 15 years. It is projected that the rate of discovery of new feedstock for petroleum will drop significantly by the middle of the twenty-first century (Daggett, et. al, 2007), and that current production trends will be unable to meet future demand for fossil fuels. Despite the improvements in aircraft fuel efficiency since 1960, further efforts need to be made in order to mitigate the dependency on traditional fuel sources and to replace current

petrol-based fuels. Furthermore, there is an increasing need for independent energy security among oil-importing countries, due both to fluctuating oil prices as well as the finitude of oil reserves in oil-producing countries.

There have been several test flights by airlines in partnership with aircraft and engine manufacturers to determine the performance of their planes using biofuel, in either a 100% or 50-50 blend capacity. Figure 2 shows some of the test flight made by various airlines using blends of biofuel.

Figure 2 Airline Test Flights Using Biofuel



What is Microalgae?

Algae fuel is a natural alternative fuel in replacing the scarcity of fossil fuel. Microscopic algae, or microalgae, which does not have roots, stems or leaves can easily be found in freshwater and marine systems, has been identified as being the most promising and the only source that could potentially produce biofuel in the quantities that are needed (Hu, 2012). Currently, biotechnologists and researchers from various institutions are actively conducting vast research in extracting the lipids (oil) from microalgae in production of biofuel for diesel engines. These research activities are being closely followed with keen interest by aviation companies including European Aeronautic Defence and Space Company (EADS) that identified algae had been

identified as an economical source for future of jet fuel. This was highlighted by Mr Louis Gallois (past CEO of EADS) during his visit to Malaysia in April 2012. Last year European airlines, biofuel producers and the EU Commission signed a pact aiming to produce two million tonnes of biofuel for aviation by 2020.

Some of the reasons for the selection of microalgae as an alternative for jet fuel are:

- Algae fuel has minimal impact on fresh water resources and is relatively harmless to the environment.
- Algae can help to reduce the CO₂ emission.
- The entire algal organism uses sunlight to produce lipids or oil, hence beneficial in producing mass capacity of fuel.

- Unlike other fuel alternative such as soybeans, algae can easily grow wherever there is fresh water and converts carbon dioxide into carbon-chain molecules (in producing oil) very quickly and efficiently.

Future research work is expected to focus on the establishing of conditions for a sustainable production of jet-fuel from microalgae in Malaysia, dedicating specific efforts on some hard points such as algae strain selection (oil extraction and oil conversion) and improving the global production chain through follow-up of the technical, environmental and economical balances of the microalgae pathway.

Industry insights

Innovative Manufacturing

Malaysia aerospace industry should concentrate its efforts on the innovative manufacturing of aerospace composite structures and producing lighter aircrafts. As lighter aircraft consumes less fuel, the increase use of composites in air crafts structures (50% of the structure in the A350 for example) is the most effective way to reduce fuel consumption.

Malaysia is already playing a very important and active part in manufacturing and supplying of composite materials for international aircraft builders. Composite Technology Research Malaysia (CTRM) which, in volume, is the fourth composite part provider of Airbus.

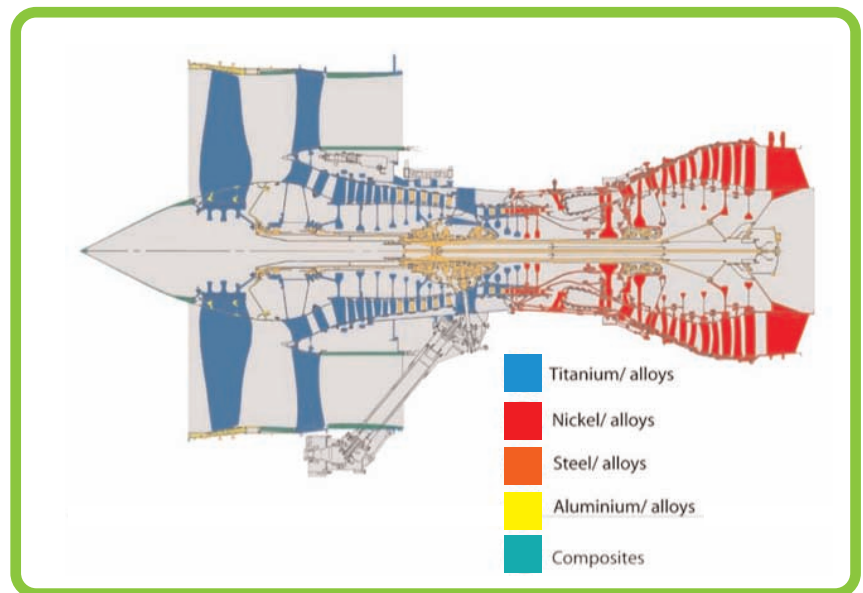
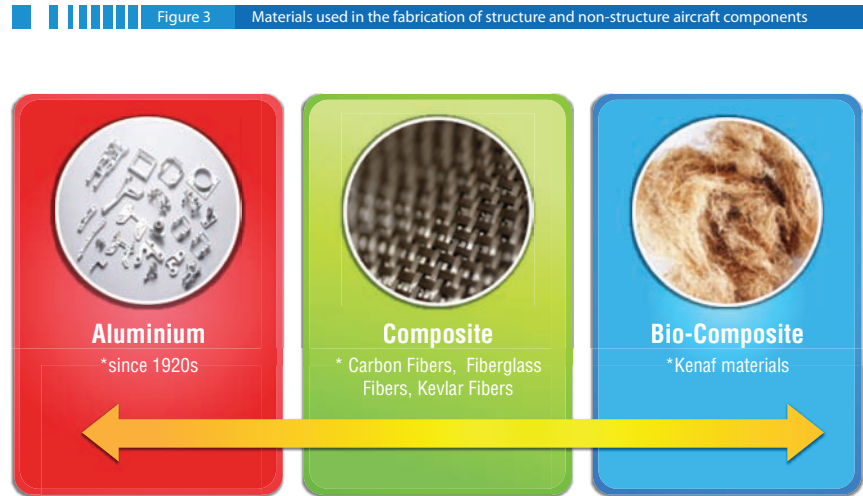
Figure 3 shows the development of different types of materials used in the aviation industry. The manufacturing of such new advanced materials requires intense research and development.

Advanced Green Materials

Materials for Gas Turbine Engine

It is known that both thermal efficiency and power output are influenced by the maximum cycle temperature and pressure ratio of the gas turbine engine. Broadly speaking, the maximum temperature has a more important effect on the power output whereas the pressure ratio has greater influence on the thermal efficiency (Endres, 1973). Thus, the use of new materials with high temperature withstanding capabilities is likely to improve the thrust-to-weight ratio of the aero-engines. For aero-engines, materials are chosen to satisfy the lightest design that technology allows for the given loads and temperatures prevailing. Figure 4 illustrates the use of different materials in gas turbine aero-engines.

The quest for more efficient gas turbines has been constantly motivated by the perpetual developments in a wide range of engineering fields including turbine design, combustion analysis and structural ceramics. Figure 5 shows the increase in operational temperature of turbine component over the years (Schulz et al, 2003). The performance of the gas turbine can be enhanced by increasing the Turbine Inlet Temperature (TIT) thereby improving the thrust to weight ratio while minimizing the specific fuel consumption. Thermal Barrier Coatings (TBCs) are



used to improve the gas turbine efficiency by either increasing the turbine inlet temperature at the present metal temperatures or by reducing the coolant requirements while maintaining the current turbine inlet temperatures. Additionally, the life of the component can be extended. Thermal Barrier Coatings are also being used in other components of the jet engine such as in combustors, liners and hot gas impingement protection on stationary components. Furthermore, current aircraft cannot fly in ashes because the turbine blades would be blocked

due to their structure with the actual TBC. To overcome such shortcomings; another reliable Thermal Barrier Coating material is required. Up to now, silica aerogel has not been investigated as a Thermal Barrier Coating material and therefore a positive result of this research will attract aerospace industries in many ways. Maerogel has been invented in Malaysia by Professor Halimaton Hamdan, in 2008 and has a cost reduction of 80% in its production compared to the traditional silica aerogel.

Industry insights

Aerogel is accepted as one of the best insulation materials by most industry experts as it can hold high temperature – up to 3,000 Fahrenheit. Aerogel is also accepted as a very good sound-proofing material, and known as the lightest solid material. It is extremely porous and very low in density. Hence, aerogel makes good thermal insulator.

There are a few types of aerogel such as cryogel, spaceloft and pyrogel (Figure 6). As the cost of production for aerogel is expensive, Malaysian researchers are trying to develop a new aerogel from rice husk as a substitute material to reduce the cost of production.

Eco-efficiency is a key to address aerospace industry sustainability and environmental impact. A significant part of eco-efficiency relies on the use of new greener materials. This innovation of the new Malaysian aerogel from the rice husk is known as Maerogel. Maerogel is advantageous for the aerospace industry because:

- Its quality is superior compared to current aerogel.
- It is environmental friendly as the basic ingredients are from rice husk.
- It uses cheaper alternative material – rice husk.
- It provides better insulation compared fibreglass.
- It is nanocatalyst.

Conclusion

Green sustainable aeronautics can only be achieved by continuous effort and support from all parties including the public, government, industries and research community. It is hoped that the future activities in and around aerospace industries would be in line with the theme to have a quieter, cleaner and more economical aerospace transportation.



(Source NASA)

Figure 5 Increase in operational temperature of turbine component over the years (Schulz et al. 2003)

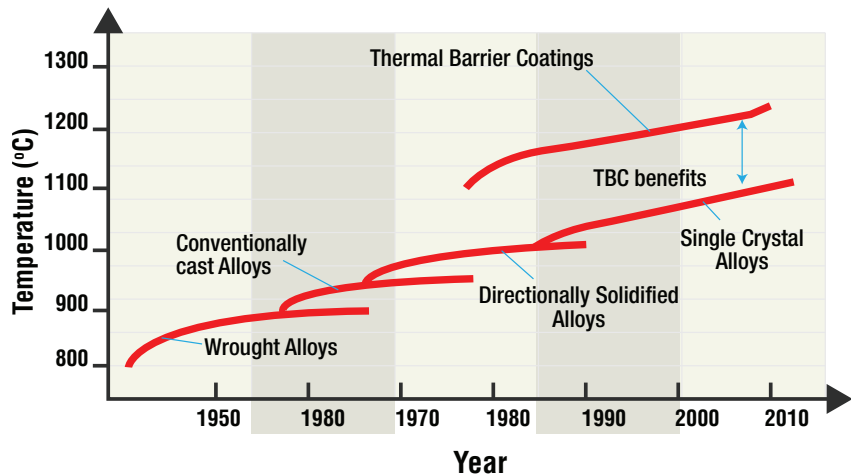
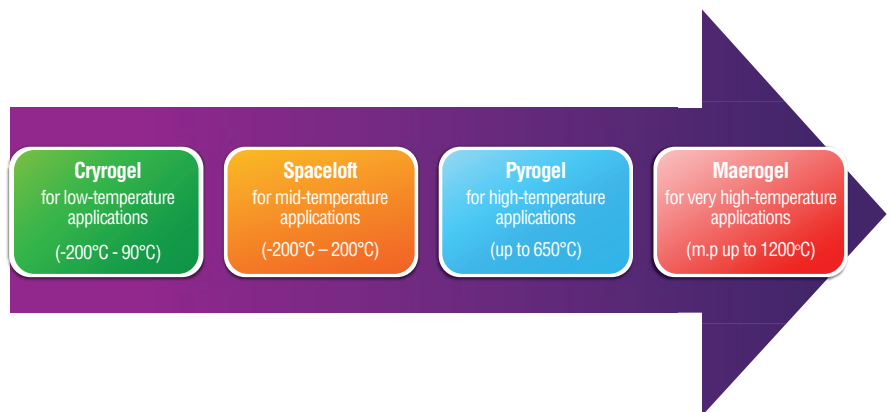


Figure 6 Different thermal barrier coating temperature performance



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Contributor Authors:

- 1) Norhuda Nordin
- 2) Norhayati Mohd Zaini
- 3) Adikkhairul Azha Mansor
- 4) Ezanee Gires
- 5) Nadiir Bekkhun

Industry insights

MYBiomass: A Unique Model for a Greener Future



BY
Puvaneswari Ramasamy
Managing Director
rpuvaneswari@mybiomass.com.my

Industry insights

Resolved to enter the world's exclusive club of "developed" countries by 2020, the Government is already on the fast lane to be at the forefront of advances in pioneering high value green chemicals biorefinery through coordinated aggregation based on the unique business model by MYBiomass Sdn. Bhd. This company is a special purpose vehicle under the Malaysian Biomass Initiative (MBI) through the Global Science and Innovation Advisory Council (GSIAC) which was endorsed by the Malaysian Prime Minister, Y.A.B Dato' Sri Mohd Najib Tun Abdul Razak.



During the 2nd GSIAC meeting in New York last May, Felda Global Ventures Holdings Berhad (FGVH), Sime Darby Berhad and Malaysian Industry-Government Group for High Technology (MIGHT) have agreed on Testing and Technology Adaptation Collaboration through MYBiomass Sdn Bhd to conduct tests in converting oil palm biomass into green chemicals building blocks.

FGVH and Sime Darby will each own a 40 percent stake in MYBiomass Sdn Bhd while MIGHT takes up the remaining 20 percent stake.

The plaque signing ceremony by Prime Minister was joined by Felda Global Ventures Holdings Berhad Group President/Chief Executive Officer Dato' Sabri Ahmad, Sime Darby Bhd. President and Group Chief Executive Dato' Mohd Bakke Salleh, MIGHT President and CEO Mohd Yusoff Sulaiman as well as MYBiomass Sdn Bhd Managing Director, R.Puvaneswari.

MYBiomass will be a focal point in supplying biomass and providing intermediate opportunities between suppliers, technology providers, and downstream users.



Testing Collaboration between Felda Global Ventures Holdings Berhad, Sime Darby Berhad and MIGHT through MYBiomass Sdn Bhd
Officially Witnessed by the Honourable Prime Minister of Malaysia
 New York, USA, 16 May 2012

From left to right: YBhg Dato' Sabri Ahmad (Group President/CEO, FGVH), Mohd Yusoff Sulaiman (President & CEO, MIGHT), YAB Dato' Sri Mohd Najib Tun Abdul Razak (Prime Minister of Malaysia), YBhg Dato' Mohd Bakke Salleh (President & Group Chief Executive, Sime Darby) and R.Puvaneswari (Managing Director, MYBiomass)

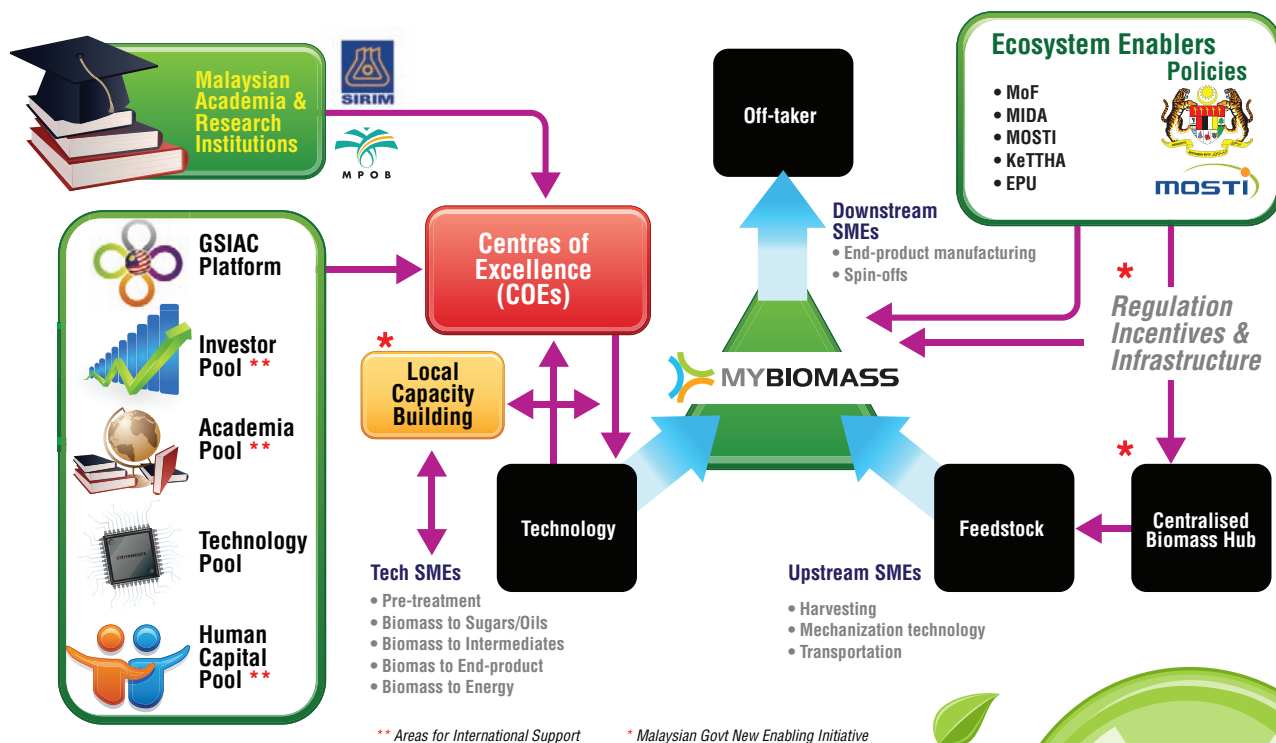
Industry insights

The collaboration is a testament to the commitment of two of Malaysia's biggest plantation conglomerates in championing the MBI, which was advocated through the GSIAC and endorsed by the Hon. Prime Minister towards the advancement of the biomass industry in Malaysia. MIGHT and MYBiomass Sdn. Bhd. were instrumental in successfully implementing a unique and workable Public-Private Partnership (PPP) model.

MBI is expected to make a substantial contribution to the production of potentially high value green chemicals for local and international downstream users. Such effort is expected to possibly benefit industries including pharmaceuticals, materials and energy.

MBI also addresses the potentials of moving up the value chain in the biomass industry by promoting

sustainable supply of biomass feedstock to end users at competitive cost. Even though the country is expected to be rich in biomass, the availability and accessibility however has become a serious challenge, especially in moving up the value chain of biomass profitability. And, although there are many other sources of biomass available in Malaysia, oil-palm based biomass will be the initial focus.



With this unique model, MYBiomass will be a focal point in supplying biomass and providing intermediate opportunities between suppliers, technology providers, and downstream users.

This noble initiative blends well with the involvement and great support by the GSIAC international members in the development of MYBiomass's role within the context of MBI. This include council members Roger Wyse, Managing Director of Burril and Co. also co-chair of Malaysian Life Sciences Fund (MLSF), Anthony J. Sinskey, Professor of Biology, Health Sciences & Technology at Massachusetts Institute of Technology (MIT) as well as Aalt Dijkhuizen, Chairman of the Wageningen University and Research Centre (WURC).

This initiative also has been supported by MOSTI, KeTTHA, MOF, EPU, MIDA, MPOB, SIRIM, BiotechCorp, AIM and academia.

The model is essentially an enhanced Public-Private-Partnership (PPP) model, with the uniqueness of having not just local support, but also renowned

international bodies and figures. The model also stemmed from a national initiative and thus supported by a Council chaired by the Prime Minister himself.

The potentially winning formula is attributed to the applicability of the model, based on the incorporation of elements from successful supply-chains. Pull-and-Push elements such as key upstream, midstream, and downstream players are key components of the model in ensuring the development of a potentially high-value green chemicals value-chain. Such players include large plantation companies i.e. biomass producer, a biomass aggregator and distributor, technology partner(s) for the conversion of biomass to chemical building-blocks, and downstream off-takers and product manufacturers.

In developing an economical supply-chain, MYBiomass Sdn Bhd also conducts studies on many parts of the value-chain such as preliminary market studies, aggregation test-runs, testing on conversion technologies, biomass-removal studies and many others.



Industry insights



Following the MBI model, MYBiomass business model includes policy makers in providing a conducive environment for the growth of the industry such as relevant monetary incentives and infrastructure supports. It requires the involvement of key Ministries, agencies, academia, and authorities from relevant economic corridors.

Apart from being a purely business-driven model, the framework also outline capacity-building elements to local parties such as academia, and local research institutions. Unlike other profit-based business models, a mature MBI supply-chain is also expected to have spill-over benefit to local SMEs.

Thus, having both a holistic and focused business approached at the same time, the model is a uniquely workable given the full support of all the mentioned parties.

Last May, MYBiomass has shipped 12 tonnes of oil palm biomass to a pilot plant facility in Italy, which is part of the initial stages of testing collaboration. The joint venture is currently studying and evaluating process feasibility of converting oil palm biomass into green chemical building-blocks. The selection of an Italian-based technology partner was based on commercial readiness and scale of production.

The first batch of shipment comprises 12 tonnes empty fruit bunch pellets, to be followed by fronds and trunks.

The initial collaboration that has brought two of the biggest oil palm plantation companies in the world into an alliance represents a potential for a much bigger cooperation in the near future that can create and transform the entire green industry in Malaysia.

The shipment to a leading foreign technology provider is intended for pilot-scale testing on the conversion of oil palm biomass. The Malaysian feedstock will be tested for its suitability for use in the production of sugars which could be processed further into high-value green chemicals.

Currently, much of Malaysia's oil palm industry is dedicated to the production of Crude Palm Oil (CPO). However, coordinated aggregation of biomass and pioneering of high value green chemical biorefinery could lead to a substantial boost in productivity and value creation in the sector.

This has a 360 degree impact on everything from jobs in plantations to downstream activities in logistics and transportation and, perhaps most importantly, new, high-value, knowledge-based growth in these science and technology related fields of the bio-economy.

Besides harnessing economic opportunities, this initiative will also create research potential and promote the development of human capital in the country.



As the focal point for biomass feedstock aggregation and supply, MYBiomass will also act as a long-term purchaser of oil palm biomass and brings biomass to market for further optimisation of the resources by moving it into higher value processes.

It is also expected to contribute substantial revenue to gross national income from industrial chemical, product manufacturing and green chemical sectors while addressing environmental issues at the same time

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Trends & Issues

Malaysia Report on Small Hydro Power (SHP)

Country Overview:

SHP Definition: 1 MW up to 10 MW¹

Population: 28.3 million

Area: 329,961 km²

Capital: Kuala Lumpur

Government Type: Constitutional
monarchy

Official Language: Malay

Currency: Malaysia Ringgit

Major Energy Sources:

Natural gas and coal

Electrification Rates:

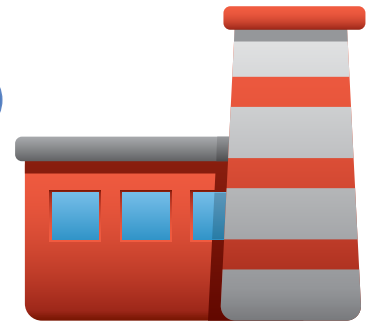
Electrification rate (%): 99.4

Population without electricity: 0.2 million



BY
Mohd Afzanizam Mohd Badrin
Head of Horizon Scanning
National Foresight Institute
afzanizam@might.org.my

Trends & Issues



Renewable Energy Policy:

The Energy Commission (EC), a government monitoring agency of the national renewable energy development has set an increase in the percentage of electricity generated from renewable energy to 5.5% compared with less than one per cent currently. The higher percentage was achievable through the establishment of the sustainable Energy Development Authority. The authority was formed as a statutory body under the Sustainable Energy Development Authority Act 2011 [Act 726].

In 2009, the Authority has developed the National Renewable Energy Policy and Action Plan. The policy and action plan aimed at creating sustainable energy through renewable resources. The document outlined five (5) objectives comprising elements of energy, industry and environmental³:

- (1) To increase RE contribution in the national power generation mix;
- (2) To facilitate the growth of the RE industry;
- (3) To ensure reasonable RE generation costs;
- (4) To conserve the environment for future generation; and
- (5) To enhance awareness on the role and importance of RE.

Installed SHP Plants and Ownership:

Today, there are twelve large scale hydropower stations and fifty eight mini scale hydropower stations in Malaysia. TNB Energy Services Sdn Bhd (TNB-ES), a wholly owned subsidiary of Tenaga Nasional Berhad (TNB) has been trusted to operate and maintain 30 numbers of mini hydro stations throughout the Peninsular of Malaysia with total installed capacity of approximately 16 MW⁴.

SHP Resource Potential:

Overall, the renewable energy (RE) industry has the potential to generate RM70 billion in revenue for the country by 2020. The RE sector is expected to create a host of spin-off benefits, including the creation of 52,000 jobs for the economy⁶. Although Malaysia had successfully benefited from the renewable resources for electricity generation, small-hydro has yet to be fully exploited. With hilly topography running almost the entire length and width of the country, and abundant number of streams flowing to foothills, Malaysia has a lot of small-hydro potential. To date Malaysia had utilized this potential mainly in the range of large and mini hydropower but very few in the micro hydro range.

In Malaysia, a total of 149 sites with estimated micro hydro potential of 28.9MW were identified⁸.

The experts are also in the opinion that the suitable small-hydro projects would be those based on the run-off-the-river schemes of sizes of up to 10 MW to 30 MW in capacity.

Currently, Malaysia has abundant water resources. The annual rainfall for Peninsular Malaysia is 2400mm, Sabah 2360mm and Sarawak 3830mm. This translates into an annual average water availability of about 28,400m³ per capita.

There are some 150-river systems in Peninsular Malaysia and about 50 river systems in Sabah and Sarawak⁹. Malaysia's principal rivers are the Kinabatangan (564 kilometres in length), Rajang (560 kilometres), Pahang (434 kilometres), Baram (400 kilometres), Lupar (230 kilometres), and Limbang (196 kilometres). A recent study identified the renewable energy resource potential in Malaysia for hydro is estimated to be RM506 million/year¹⁰. It is also predicted that by the year

2020, most rivers and waterways will be fully utilized especially for the generation of electricity.

To assess the suitability of a potential site, the hydrology of the site needs to be known and a site survey carried out to determine actual flow and head data. Hydrological information can be obtained from the meteorology or irrigation department usually run by the national government. However there are some challenges in small-hydro plant. Water scarcity would happen in the next 10 to 15 years as more rivers become dry, silted or polluted. Research and development are essential in facing those future challenges. Focus shall be given to the on current run off river (e.g. upgrading capacity of existing hydro plant), relook at design and engineering (e.g. system design and component), introduce new concept (e.g. run on river, waste water, water falls, water reservoir) as well as hybrid systems (e.g. hydro-solar, hydro-hydrogen).



Trends & Issues

Table 1 List of Mini-Hydro Stations (TNB) in Peninsular Malaysia

No	Station	Town	State	Capacity (kW)
1	Sg. Ulu Langat	Kuala Lumpur	Kuala Lumpur	2,200
2	Sg. Kerling	Rawang	Selangor	900
3	Sg. Benus	Bentong	Pahang	300
4	Sg. Perdak	Bentong	Pahang	364
5	Sg. Sempam	Raub	Pahang	1,250
6	Sg. Sia	Raub	Pahang	548
7	Sg. Pertang	Raub	Pahang	492
8	Sg. Ulu Dong	Raub	Pahang	550
9	Sg. Rek	Kuala Krai	Kelantan	270
10	Sg. Sok	Kuala Krai	Kelantan	588
11	Sg. Lata Tunggil	Kuala Krai	Kelantan	700
12	Sg. Renyok	Jeli	Kelantan	1,600
13	Sg. Kemia	Jerteh	Terengganu	526
14	Sg. Brang	Kuala Berang	Terengganu	422
15	Sg. Tersat	Kuala Berang	Terengganu	488
16	Sg. Cheralak	Dungun	Terengganu	500
17	Sg. Bil	Tanjung Malim	Perak	258
18	Sg. Kinjang	Tapah	Perak	349
19	Sg. Kenas	Kuala Kangsar	Perak	532
20	Sg. Asap	Kuala Kangsar	Perak	110
21	Sg. Gebul	Kuala Kangsar	Perak	120
22	Sg. Chempias	Kuala Kangsar	Perak	120
23	Sg. Lawin	Lenggong	Perak	270
24	Sg. Temelong	Lenggong	Perak	872
25	Sg. Tebing Tinggi	Selama	Perak	178
26	Sg. Mahang	Selama	Perak	483
27	Sg. Kupang	Baling	Kedah	216
28	Sg. Mempelam	Baling	Kedah	397
29	Sg. Tawar Besar	Baling	Kedah	540
30	Sg. Mentawak	Pulau Tioman	Pahang	500
TOTAL INSTALLED CAPACITY				16,643

There are also few public licensed mini hydro installations by private sector such AMDB Perting Hydro Sdn Bhd, Sg. Perting, Bentong, Pahang (4.2MW), Syarikat Esajadi Power Sdn Bhd, Sg. Kaingaran, Tambunan, Sabah (2.5MW), Sg. Kadaiaian, Kota Belud, Sabah (2MW) and Sg. Pangpuyan, Kota Belud, Sabah (4.5MW)⁵.

Table 2 Installed Capacity of Mini-Hydro Power Stations in Malaysia⁷

Location	No. of Project	Capacity (MW)
Peninsular Malaysia	Kedah	1.556
	Perak	3.207
	Terengganu	1.936
	Kelantan	3.158
	Pahang	3.504
	Sub-total	13.361
East Malaysia	Sabah	8.335
	Sarawak	7.297
TOTAL		28.993

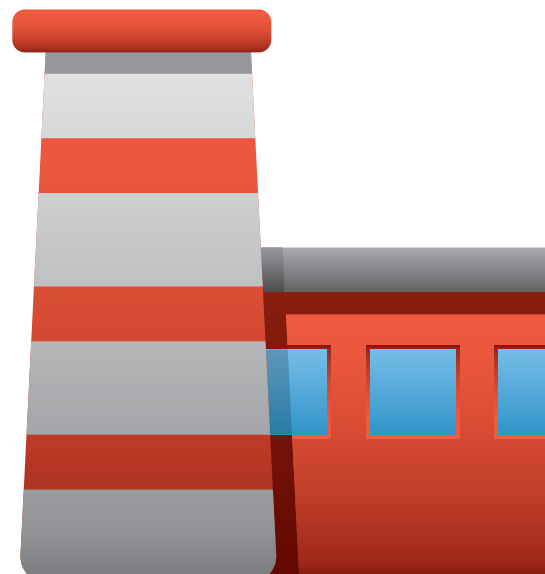
Historical Development and Planned Future Development:

The hydropower utilization for electricity generation in Malaysia started in July 1900 when a small hydroelectric plant was constructed on the bank of Sempam River near Raub, Pahang, by the Raub-Australian gold mining company. The utilization of hydropower in Malaysia to supply electricity for domestic use however, was only commercially available around the 1970s.

To date, the Government through the Ministry of Energy, Green Technology and Water (MEGTW) is seriously looking at renewables as an alternative energy source. The 8th Malaysia Plan (2001-2005) and 9th Malaysia Plans (2006-2010) had introduced several programs such the Small Renewable Energy Program (SREP), the Biogen Full Scale Model (Biogen FSM) Demonstration Project and the MBIPV program. Among the most popular technologies for RE in Malaysia is the mini-hydro (87.7MW), biomass (using palm oil empty fruit bunches), biogas (from palm oil mills effluent) and municipal solid waste.

Currently, hydro-generated electricity is suited for remote applications i.e. villages. Small hydro is often used to replace diesel generators or other small-scale power plants or to provide electricity to rural populations. Some rural areas, however, are distant from the electricity generation and transmission infrastructure.

In these cases, use of distributed power generation technologies such as solar hybrid power generation or micro hydro-electricity to provide access to electricity is greatly viable. These solutions have been applied in approximately 17% of the new connections during 2010-2012¹². The target is to provide five times as many houses with electricity as compared to what had achieved in the 2006-2008 timeframe.



Trends & Issues

Table below lists the status of Small Renewable Energy Program (SREP) implementation in Malaysia, as of end 2011¹¹. Several RE projects approved have already made a significant progress.

Table 3 Status of SREP Projects in Malaysia (as at December 2011)

No	Category	No. of Project	Capacity (kW)
1	Biomass	Empty Fruit Bunches	17
		Wood Waste	1
		Rice Husk	1
		Solid Waste	1
2	Landfill Gas	3	3.16
3	Biogas (agro-based)	7	25.85
4	Mini-hydro	13	87.7
5	Geothermal	1	30
TOTAL		44	334.71

Hydropower and Sustainability/EIA:

At the national level, one of the challenges faced by small-hydropower projects is the affect of collective action and participation of users and industry players. In addition to that, the access to water and the use, control and diversion of water flows is subject to federal and state regulations. There are other regulations that apply to physical alteration of a stream channel or bank that may affect water quality or wildlife habitat. The hydro-power systems must not create any pollution when they are operating.

It is well known that ecological impact of small-scale hydro is minimal; however the low-level environmental effects must be taken into consideration before construction begins. Proper caution must be excised in order to ensure there will be no damaging impact on the local ecology or civil infrastructure.

Small-hydro projects can play a role in encouraging sustainable watershed management. In ensuring those factors are put into consideration, RE developers are required to adhered procedures and processes of other agencies such as the Department of Environment (DOE) for environmental impact assessments, State Authorities for land conversion approvals and for water abstraction rights and permissions (in mini-hydro) and local authorities for structural plan approval.

Although hydro power technologies are highly developed, sustained and more innovative research is always needed. Research on siltation such as how to solve high sedimentation problems of the river should be carried out. Other important aspects such as the design of the turbine, effects of small-hydro on rivers, underground tunnels and discharge also need to be researched.

Barriers:

Despite the overall benefits of renewable energy technologies particularly hydro-power, its full exploitation is constrained by certain practical limitations. For example, some of the well recognized issues in the water sector include localized water shortages during dry seasons, pollution affecting more than half of Malaysia's rivers, climate change as well as institutional and

regulatory complexity and inconsistency. The common barrier in the development of mini/micro hydro project is capital cost which is relatively higher than conventional power plant. Maximizing local content by utilizing locally manufactured components and designing correct components selection and sizing with appropriate operation strategy will alternatively reduce the project costs. Financial and technical assistance is relatively important in facilitating the development of small hydro power in Malaysia.

Meanwhile, in the commercial sector, many developers of renewable energy projects do not survive and their projects abandoned due to project variation.

Malaysia appears to be facing a number of specific challenges, including:

- (1) Difficulty in obtaining financing at competitive rates;
- (2) Financial institutions are unfamiliar with new technologies;
- (3) High financing cost;
- (4) Public perception that renewable energy is still experimental; and
- (5) Uncertainty in renewable resources. A key challenge is to ensure sufficient continuous supply of the sources.

In summary, the main barriers for renewable energy can be summarized as:

- (i) Awareness
- (ii) Government Policies
- (iii) Financial Support.

Table 4 Factors Affecting the Sustainable Hydro Power¹³

Social	Remote areas has limited access to energy supply	Focus more on rural areas
Political	Bureaucracy issues and problems e.g. land acquisition	Involve many parties to get approval to build a hydro plant as identified sites
Economy	Small-hydro is the most economical RE but it depends on availability of in-situ resources	Engineering and design can be site specific, the simpler the better for remote communities
Technology	Operation and maintenance	Technical authorities and local authority
Environment	River is subject to silting, polluted with waste	Need to address this issue

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Trends & Issues

Keeping up with the Trends in Maritime Sector.

Nazery Khalid, Senior Fellow at Maritime Institute of Malaysia (MIMA) discusses the trends and developments affecting seaborne trade and emphasizes the need for stakeholders to stay abreast of them in order to be competitive



Whether we realize it or not, Malaysia's economy would not be the diverse, strong and flourishing economy it is today and we would not be able to have access to a variety of goods at reasonable prices. Without safe, secure and clean seas, global trade, marine tourism, fishery and offshore activities would be disrupted and our economy would be poorer for it.

Although Malaysia have done reasonably well to take advantage of our maritime features and harness economic benefit from the sea and its bountiful resources, a lot more could be done to enhance the contribution of the maritime industry to the nation's economy.

Malaysia enjoys many advantages that can be optimally harnessed to make it a globally competitive maritime nation. We are blessed with being in a strategic location in between Straits of Malacca and South China Sea that links East and West maritime trade. We have a long coastline, good infrastructures, good institutional framework, political stability, rich with natural resources, flourishing manufacturing sector and relatively low cost of production, to name a few.

Malaysia has notched impressive success in the maritime industry. In recent years, we have emerged in the top five in the list of countries with the busiest port traffic among developing countries. Container throughput at local ports has been growing steadily, averaging around 15 mil. TEU (twenty foot equivalent unit) in the last three years and is expected to reach 21 mil. in 2012. With Port Klang and Port of Tanjung Pelepas ranked 13th and 17th respectively in the list of world's busiest container ports in terms of volumes handled in 2011, Malaysia can indeed be proud of our ranking among the giants in the container sector.

This success owes in large part not only to Malaysia's strategic location in a dynamic economic

region and along busy shipping lanes but also to astute planning and strong support from the Government to the maritime industry. Malaysia has put in place several policies and a strong institutional framework to develop its maritime industry. These include the policy to make Malaysia a maritime nation, the introduction of Cabotage Policy that reserves the carriage of domestic seaborne trade to local shipowners, and the designation of Port Klang as a National Load Center. The Ministry of Transport Malaysia, through its Maritime Division, is the lead agency responsible to develop a modern, safe and competitive maritime industry, and can take some credit for Malaysia's achievements in the port and shipping sectors.

Trends & Issues



However, there is much room for improvement to make Malaysia a truly competitive maritime nation and to optimally harness its features, location, advantages and infrastructures and for the maritime industry to attain greater heights. As competition heats up from regional ports to attract shipping lines and handle more cargos, Malaysian ports and players in the maritime industry must invest in capacity and human capital and improve their productivity, efficiency and customer service in order to retain and win bigger market share.

Getting a good grip

There is a multitude of factors that affect seaborne trade and shipping patterns. Malaysia's fortunes as a trading and maritime nation depend on the ebb and flow of international trade and finances, economic developments, production and consumption patterns, and shipping trends, among many others. The stakeholders in the maritime industry are manifold, including regulatory authorities, shippers, shipping companies, port owners/operators, shipbuilders and ship repairers, oil and gas companies, components manufacturers, financial institutions and maritime support service providers.

In the complex and interdependent 'universe' of the global maritime industry, each stakeholder can be affected by developments in sectors beyond their own. As such, it is imperative that they pay keen attention to and get a good grip of trends and developments which directly or indirectly affect the maritime industry.

Being the world's 24th largest trading nation (World Trade Organization ranking, 2010), Malaysia's trade performance is heavily influenced by the state of the economy of its trading partners. Malaysia is not immune from the global recession and Eurozone crisis affecting economies worldwide, despite its economy performing reasonably well in recent years. The demand for Malaysia's exports has slowed down and is expected to further soften this year. This will affect the number of shipping calls hence throughput at the nation's ports, and subsequently impact a host of activities that support the maritime industry.

There are several developments that affect the maritime industry that warrant close inspection as they are and could be detrimental to Malaysia's interests. A solid grasp of the dynamics of these potentially game-changing developments is crucial to prepare the local stakeholders in the maritime industry for the challenges and eventualities and to put them in a position to reap the opportunities that may arise therefrom.

For a start, the rise of China as a global economic power and as a nation with growing maritime ambitions must be closely analyzed. Its rapacious demand for raw materials and consumer goods and prolific production of manufactured goods has been among the most influential factors shaping today's global trade and economic landscape and the maritime industry. Malaysia has certainly benefited from the rise of China, as evidenced by growing transshipment cargos involving China trade at our nation's main seaports and growing Chinese demand for our exports. However, there could be cause for concern for us should shipping services servicing China trade change pattern and trend. Port Klang, the nation's largest port, and PTP, its

transshipment hub, are the first stopover for merchant ships en route to China from the West and the last port of call in the China-West voyage. Should ships from China sail full load from its ports to destinations out West, there would be little need for them to stop at Malaysian ports to pick up cargos. This would result in a drop of transshipment cargos handled by our ports and could cause adverse effects to the port owners and to Malaysia's economy.

The worry that China's economy will grow at a slower rate in 2012 arising from sharp drop for its products from Eurozone, its largest trading partner, is set to send shockwaves to a world economy still reeling from the global recession. Should the Chinese economic juggernaut stutters, the impact to Malaysia's ports will be considerable. Transshipment trade, which has been one of the growth sectors to our ports, will drop and drag down total throughput of our ports.

The prospect of the US economy, still the world's largest by far, continuing to be in the doldrums is another source of worry for Malaysia. With the US being our tenth largest trading partner, we are sure to feel the heat from the dismal condition of their economy.

Consider also the potential impact of this other major development in the maritime industry; the widening of Panama Canal. This massive engineering project will result in bigger merchant ships being able to sail through the vital shipping lane. This is set to change the shipping patterns in the American continent and may send reverberations elsewhere. Cargos landing at ports along the West Coast of the United States may not need to be hauled across the continent to the East Coast, as is the practice now. A wide Panama Canal will enable cargos from East Asia to be shipped from ports along the Pacific seaboard to those along the Atlantic seaboard. This could see ports in the Caribbean and Gulf of Mexico flourishing and could well trigger a series of chain effects that may affect Malaysia's interests in the Trans-Pacific seaborne trade.

Worth evaluating also is the dynamics that could be triggered by the thawing of the ice sheet in the Arctic that has carved a passage for ships. This new route will see ships able to sail from Japan and northern China to northern Europe, and vice versa, bypassing the traditional East-West shipping route through South China Sea and Straits of Malacca. Although it is by no means guaranteed that the 'Arctic route' will ensure cost-efficient and economically viable merchant shipping across the pole, it would not be wise to dismiss outright the possibility of the route flourishing and not to ponder its implications on Malaysia's seaborne trade interests. How would our ports fare if shipping lines between East and West bypass the Straits of Malacca and South China Sea in preference of the 'Arctic route'?



Trends & Issues



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Another global trend that is significantly shaping the maritime industry landscape is the deployment of growing size of merchant vessels. A combination of shipping economics, accommodating ship financing market, advent in shipbuilding technology and enhancement of port capacity, productivity and efficiency has conspired to fuel the bullishness of shipowners to commission the construction of bigger ships. The largest bulk carrier (carrying commodities such as iron ore and coal) in existence today has a whopping capacity of 380,000 DWT (deadweight tonnage) while the biggest container ship in service can carry an amazing 18,000 TEU containers. Such ships require ports with deep draft (harbour water's depth) to enable the ships to call at those ports, not to mention adequate facilities like cranes and trucks and a high degree of productivity and efficiency to enable their massive cargos to be loaded and unloaded in the shortest time possible.

For Malaysian ports to be able to attract these kinds of ships, the port operators and economic planners must put in place the necessary features, facilities, equipment, manpower and land-based support services to match the sheer size, capacity and complex handling requirements of these vessels. Ports unable to accommodate the big vessels will be bypassed by them and will be reduced to playing a feeder role to larger ports where these behemoths can call. The loss of economic opportunities of being left out from the loop by these ships could be significant to Malaysia.

In recent years, ports in the region have embarked on aggressive expansion to serve their users better and in anticipation of growing demand for shipping services and global seaborne trade. Not only their operators are offering features and facilities of international standards, they are doing so at very competitive

rates. Malaysian ports can no longer bank on their advantages of strategic location, good infrastructures and competitive tariffs as other ports in the region can also boast of the same features and are giving our ports a run for their money. Never mind the world's top three container ports in Shanghai, Singapore and Hong Kong; Malaysian ports must now look over their shoulders and face growing competition from neighboring ports such as Laem Chabang Port in Thailand and Tanjung Priok near Jakarta in Indonesia. As competition among ports to attract shipping lines and handle more cargos heats up, Malaysian ports must strive to leverage on their strengths and continuously improve their productivity and efficiency and provide value-adding services to compete with neighboring ports.

The specter of mega-projects such as the construction of Kra Canal, landbridge in the Kra Isthmus and oil and gas pipeline linking China and Central Asian countries coming into fruition may also affect shipping traffic and cargo throughput at Malaysian ports especially in the Straits of Malacca. Granted, a project like Kra Canal does not look like it is going to materialize anytime soon, if at all. However, a nuanced analysis of these plans is warranted in order to anticipate the consequence and to shape the necessary responses to safeguard Malaysia's maritime and strategic interests should these plans are realized.

The gradual but unmistakable shift towards green practices in the maritime industry must be given due attention too. Efforts to reduce pollution and emission of green house gases (GHG) from merchant vessels and in other maritime activities such as port operations, shipbuilding/ship repairing and the exploration and production of oil and gas demand stakeholders

in the maritime industry keep abreast of the trends, issues and challenges in these areas and pay close attention to the international conventions related thereto. As a council member of the International Maritime Organization (IMO), the specialized United Nations body responsible for safe, secure and clean oceans, Malaysia must lead from the front in contributing to the greening of the maritime industry and reducing its carbon footprint. It must also be mindful of the potential impacts on its interests of international efforts to introduce market-based mechanism to reduce emissions from shipping. This is a very technical area which Malaysia admittedly is not familiar with but must strive to overcome the steep learning curve to be in tune with developments.

Other challenges faced by the maritime industry include the tightening of financing for the maritime industry amid global recession and Eurozone debt crisis; meeting manpower requirements; meeting increasingly complex demand for shipping, ports and other maritime services; protecting the welfare of seafarers and offshore workers; ensuring navigation safety especially in busy shipping lanes; addressing the impact of climate change; overcoming the threat of piracy; and dealing with the threat of terror on maritime assets. Dynamic changes in the port operations and shipping business – as seen in changes in ownership structure, business model, investment strategy and competition regime, among others – are shaping the landscape of the maritime industry.

Change, the only constant

In today's complex world in flux, change, as the saying goes, is the only constant. Those who resist changes and are not prepared to adapt accordingly will be left behind.

The trends and developments discussed unleash forces that are too strong for players in the maritime industry to resist. The forces emanating from these changes have reshaped the landscape of seaborne trade and the activities that facilitate it, and will no doubt continue to reconfigure and influence the industry. Players must be ready, willing and able to adjust their operations, strategies and even mindset along with these changes or risk being out of touch, losing competitiveness and becoming irrelevant. The fast moving trends and developments affecting seaborne trade and the maritime industry require Malaysia's maritime industry stakeholders to always be on top of them. They must develop deep understanding of the underlying factors affecting global seaborne trade and their business in order to be ready to face the threats and challenges they pose and reap the opportunities they present. Doing so calls upon them to come up with appropriate strategies, allocate resources and prepare contingency plans to respond quickly and face the eventualities arising from these developments.

PLAYING A ROLE IN THE GROWTH OF NATIONS



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GLOBAL NETWORK

- | | | | |
|---|---|--|--|
| ASIA REGION | MIDDLE EAST & AFRICA REGION | EUROPE REGION | NORTH AMERICA REGION |
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SCOPE OF MAIN ACTIVITIES

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- Building & Airport Construction
- Onshore and Offshore Pipelines
- Petrochemical Tank Farms
- Steel Fabrication
- Integrated Transport Information System Provider

CRANE

- Onshore & Offshore Crane
- Wharf / Multi Purpose Crane
- Tower Crane
- Crawler Crane
- Winches

SHIPYARD

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- Ship Repair
- Ship Conversion
- Ship Supplies
- Offshore Structures

CONCESSION

- Airport
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LNG Regasification Project, Malacca



Pre-Assembly Gordon LNG Jetty & Marine Structures Project for Barrow Island LNG Plant, Australia



Offshore Crane FAVCO PC 1000 for Jack Up Barge B.V
Lifting capacity: Max. Lift 1000 tonne @ 22m radius
Boom Length: 60.76m to 97.23m



Newly Fabricated 70m Anchor Handling Tug Supply / DP2
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LOT 586 & 579, 2ND MILE, JALAN BATU TIGA LAMA, 41300 KLANG, SELANGOR, MALAYSIA

Tel: +603 3342 4323 Fax: +603 3342 4327 / 9816

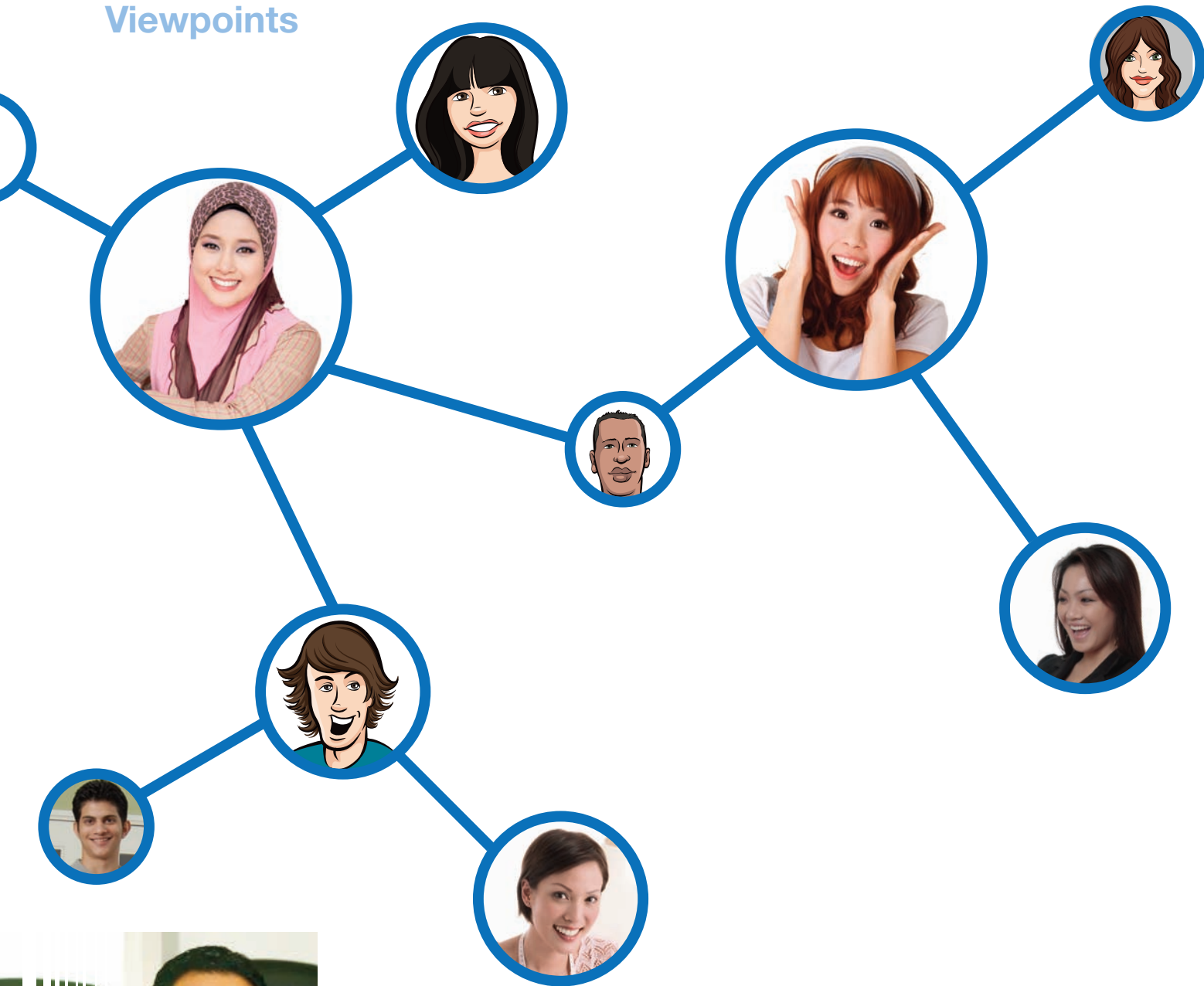
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Viewpoints



FUTURE OF SOCIAL MEDIA

BY

Abdul Rahman Hamdan

Principal Analyst 1,
Consultancy & Offset Management Services
rahman@might.org.my

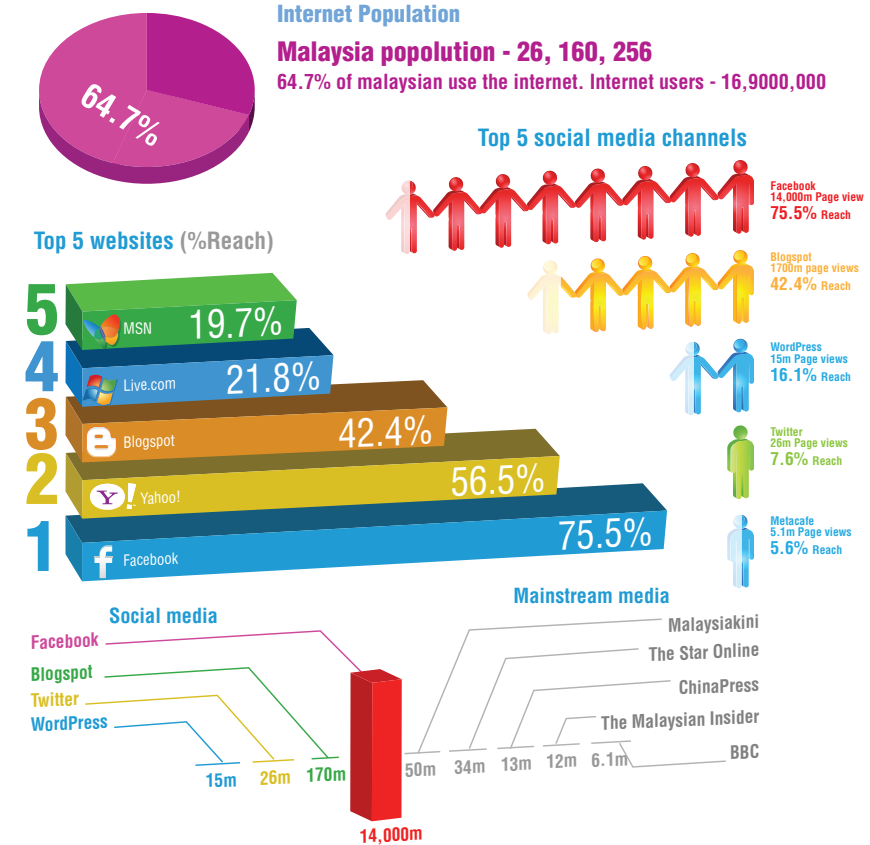
Viewpoints

OVERVIEW

On 18th May 2012, Facebook became a public listed company and its stock has begun trading on the Nasdaq Stock Market. Facebook priced its IPO at US\$38 per share and valued the company at US\$104 billion or RM325 billion. This value is even higher than Yahoo, eBay and Groupon combined. If this figure does not impress you imagine this: With over 900 million users, if Facebook is a country, it would be the third largest country in the world after India and China. According to The Star, Facebook users in Malaysia alone reached 12 million last year. The top five Social Media channels in Malaysia according to Burson-Marsteller in 2011 are Facebook, Blogspot, Wordpress, Twitter and Metacafe, with Facebook representing 75.5% of users reach.

Facebook heralded a new era of the media, hence the Social Media. It represents a new way of disseminating information and content sharing. The interaction of the traditional media such as television, radio, and newsprint have always been a one way interaction, with the public being at the receiving end. Interactions can be done through these media but not on a real-time basis. Even by allowing interaction, limited freedom are given to the public as the editors or content managers of these traditional media control what should be and what should not be printed or aired. This creates monopoly of content and some politicians, or even governments, use this advantage as a tool for propagating their interests to the public.

However, it is hard to appreciate the new media if you do not know the origin of the traditional media. Basically, media is known as a method of communication between people, commonly used to distribute news, information and views. The need to disseminate information was well established even when our species were living in caves. This can evidently be seen from the cave paintings and stone manuscripts. The method then evolved into other forms of disseminations such as using homing pigeons and manuscripts using bones, clay tablets and papyrus. As people developed new technology for printing, newspaper was created and circulated to people and it remains as the popular choice of media for sharing information up until the 21st century, besides television and radio. And then the internet was born. The main reason behind the



Source: Burson-Marsteller Asia-Pacific

creation of the internet is basically for connectivity between computer users. The ARPAnet, considered as the grandfather of World Wide Web was created in 1969 with the objective of connectivity and data sharing. From that simple solution, the internet has now evolved into what is now known as Web 2.0.

The evolution of this media has one common objective – to connect with people through the sharing of information. Human beings are always curious, and curiosity helps human species to develop and advance through researches, explorations etc. We want to know what is happening around us and especially people close to us. We always want to know what is happening around us and to

people close to us. According to Anthony Robbins, one of the basic needs of human being is to stay connected with one another. We have this dire need to know things around us that may or may not affect us.

The success of the new media is that it allows the connection to happen among a large number of people in the world simultaneously and in real-time. One can now have an access to important real-time information of public interest such as a natural disaster or unimportant private information such as a friend just went to the bathroom. Whatever the reason is, these new media represents a new level of connectivity that cannot be obtained from the traditional media.

WHAT IS SOCIAL MEDIA?

Human beings have always been social even without the aid of the internet. Previously, the need for social engagement depended mostly on social events and the traditional media. Only with the creation of the internet we learn to rely less on this traditional method. Social Media offers us unique identities, but with global access.

The interaction is done in real-time and with instant result. Andreas Kaplan and Michael Haenlein define Social Media as "A group of internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content." According to them, there are six different types of Social Media. The six types are Collaborative Projects, Blogs and Microblogs, Content Communities,

Social Networking Sites, Virtual Game Worlds and Virtual Social Worlds. Among the popular names that are usually associated with Social Media are Facebook, Twitter, YouTube, Foursquare, Wikipedia and Blogspot. The platform behind Social Media is basically the internet that consists of web-based and mobile based technologies. These technologies are used to translate communication into interactive dialogue among the users through a shared platform.

Viewpoints

WHO ARE THE PLAYERS?

There are several players who emerge quite early in the game such as Friendster and MySpace in the early 2000. However, users are quick to change their Social Media platform based on current trends and popularity. As older players grew out of favour, new players emerged from the industry and became the new trend for the users. Among notable players that have dominated the Social Media industry for recent years are Facebook, Twitter and YouTube. Google enter quite late into the picture with their Google Plus platform. The latest giant to enter this industry are Microsoft with the launch of So.cl.

In Malaysia, among the notable player in the Social Media industry is MOL Global Bhd which is controlled by Tan Sri Dato' Seri Vincent Tan. MOL Global have acquired Friendster for US\$39 million in 2008 and later sold off the patents owned by Friendster to Facebook in exchange of 700,000 shares in 2010. These were subsequently increased to 3.5 million shares. In 2011, Friendster relaunched its product as a social gaming platform.

WHAT'S NEXT?

As time goes by, Social Media will be more integrated into our daily lifestyle. This ranges from the moment we wake up to brush our teeth, to when we shop in our favourite mall. It will be ubiquitous as the technology of internet based mobile applications gets much smaller and have stronger computer power. Dennis Crowley, co-founder of Foursquare said, "The future of Social Media is that the social graph becomes so ubiquitous in everything we do that we stop using the term 'Social Media'. The normal social experience of shopping will be further enhanced as we will be having at our fingertips a river flow of information such as who among your friends have been there, what do they bought and their reviews on the products.

The Social Media has impact the way the industries operate their businesses. Before the existence of social media, the industry has always relied on traditional media such as television, radio and newsprint for their marketing. But today producers and marketers are using social media to introduce, promote, advertise, and even sell their products. Even the traditional media is jumping on the bandwagon and starting to embrace the Social Media by making it an integral part of their business. This can already be seen in some Television programmes that integrate live tweets from their audiences. Among notable international publishers that have already embraced Social Media are Wall Street Journal who leveraged on Instagram applications to interact with their readers and The Economist who optimized Google Plus and YouTube to generate dialogues and debates. In Malaysia, Media conglomerate giant, Media Prima created specific account in YouTube and



Facebook for each of their subsidiaries such as TV3 and Hot FM. Interactions are sometimes done real-time during live programmes and inputs received are used to improve their shows. The Star, the publisher of one of the most widely circulated newspaper in the country, introduced an application called iSnap. The creation of iSnap is designed for The Star to reinvent content publishing and bring alive the newspaper content to its readers in a different and fresher way.

Through Social Media, learning experience will also be enhanced as high quality education can be accessed by almost anyone and anywhere. This was already shown by Khan Academy that was created in 2006 by Salman Khan, a graduate of MIT and Harvard Business School. By utilising YouTube, the group provides free online collection of video tutorials that covers various

subjects – from mathematics, history, healthcare, and economics to physics. People around the world with access to internet will be able to learn instantaneously through this platform.

On the commerce front, the Social Media is already making an impact to the commerce activities. It is now creating a massive shift of consumer's behaviour from just simply searching for information on product to searching information on product based by people preferences and review. For the last three years, we have witnessed the exponential growth of registered users of Social Media platform. As businesses now started to learn about this new media, for the immediate future we will see enterprises integrating with this Social Media and grow their businesses by tapping into these platforms.

Viewpoints



FUTURE TRENDS

Some of the current trends that are predicted to shape and ultimately change the landscape of Social Media in the future are:

Augmented Reality

Augmented Reality (AR) is defined in the Wikipedia as "a live, direct or indirect, view of physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data." The objective of Augmented Reality is to create a system whereby the user's reality is combined together with Virtual Augmentation. By using this technology, the world's environment in where the users are currently interfacing can be duplicated in a computer. The system allows the environment to be augmented with additional information through the use of smartphones, mobile computer and internet. Even though Augmented Reality has not taken off quite yet, it is widely expected that it will be the main force in shaping the Social Media in the near future. The trend can already be seen as Google has recently started the development of what they called Google Glass. It is a glass that is equipped with Augmented Reality technology and will give the users the experience of a Virtual Augmented Reality lifestyle.

Location-based Services

The Computer has evolved from the Mainframe Computing created in 1960s to Desktop Computing in 1990s and finally to Mobile internet Computing. This is made possible by the

significant increase of computing power and the miniaturization of some of the electronic components. The next decade will see the rise of mobile computing when smartphones and tablets become more affordable. We will witness more hardware and software being developed to further assist people in terms of connectivity and mobility. Social Media will benefit from this as flux of information will be channelled through this medium. One example of a Social Media platform which took advantage of this is the Foursquare application. Created in 2009, the application serves as a Location-based Social Networking platform for mobile device users. Users can check-in their current location or places of hangout and at the same time give reviews of the place or product. Users can also use this application to connect with friends nearby. As technology for internet mobility becomes much more sophisticated, it is expected that a number of Location-based Social Media platform will also be developed.

Applications

When Apple introduced its iPhone in 2007, it also introduced iOS, a mobile operating system for the iPhone. The user interface for the operating system is based on multi-touch gestures and movement supported by the iPhone internal accelerometers. Apple also released a Software Development Kit (SDK) where developers can use it to create applications for the iPhone. This business model has created a new revolution for the creative multimedia industry whereby any developer can now develop and market their applications in the Apple's marketplace called Application Store. Many of today popularly used Applications are the result from developers developing applications for the iOS platform. Another popular mobile operating system is Android, a Linux-based operating system for mobile devices. It was acquired by Google and similar to iOS, Android has a large community of developers that develop the applications for Google marketplace called Google Play. However, Android is different from iOS as it is open for licensing to any smartphones and tablets manufacturers whereas iOS is exclusively for Apple's product. On the latest development, Microsoft is also joining the fray by introducing its own mobile operating system called Windows 8. With these positive developments, it is expected that, in the next decade, more and more applications will be developed.

Intelligent Recommendations Services

As the Social Media platform grew, there will be an increase of user-generated content data in the internet. This will result in the influx of information flooding the daily users of the internet every second of the day. A system is needed to filter out this tremendous amount of information and to customize and tailor it according to the need of the customer. Technology supporting the system will be created to understand and

capture consumers' behaviours and preferences down to the individual level. Enterprises can benefit from this as they can identify and select potential customers and target audiences. Therefore it is inevitable that better and intelligent recommendations services will be developed in the near future.

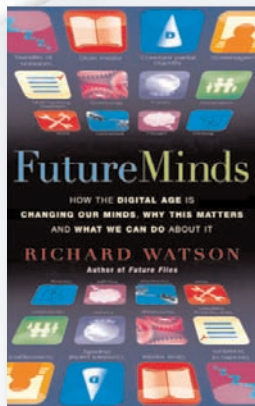
Evidently, these intelligent recommendations services exist in current website and applications. Amazon.com provides one of the best pioneer examples of this system. Each time a customer purchased books or other items in Amazon.com, the website intelligently captured the user's preferences and interest. The next time the customer logged into the website, the customer's landing page will have advertisements on items that are related to the user's purchased history. Recommendations are also made by the website on what the customer should buy. Hence, in the future, instead of people browsing the internet for information, the internet will basically 'browse' people and deliver dedicated information.

CONCLUSION

As John Lennon once said, "You may say I'm a dreamer, but I'm not the only one. I hope someday you'll join us. And the world will live as one." These words amplified the need to have a platform for people in the world to connect. In Lennon's case, it was music that will bring people together. Today it is the World Wide Web. It is inevitable that someday, almost every person in this world will be connected.



Mark Zuckerberg, Founder of Facebook, said, "When you give everyone a voice and give people power, the system usually ends up in a really good place." As Social Media gives everyone a voice and give people power it is, and probably will remain, one of the most important medium of communication that connect the people.



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Future Minds

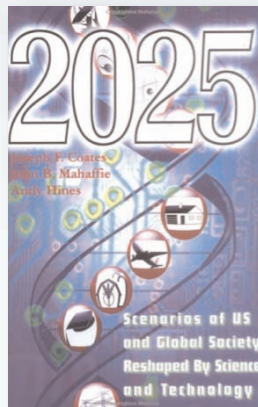
Our world has changed... dramatically. Designers have unveiled the world's first child-care robot; children as young as five are spending up to eight hours a day in front of screens; the average teen sends as many as 2,000 texts a month; machines are competing with our minds for employment and soon they will compete for our affection.

We're rocketing into the digital age at breakneck speed: a culture of rapid response with no time for reflection or focus. Losing the ability to think with depth or empathy, we are in danger of raising a new generation that has plenty of instant answers but no deep questions or relationships.

Drawing on the latest research, this book looks at the ways that screen culture is shaping the future and changing the way we think. Future Minds asks: are we becoming addicted to data and how do we go about starting a digital diet, urgently?

In this book you'll find thought-provoking and practical suggestions about reclaiming the space and time to think deeply.

This is for anyone who's curious about rethinking their thinking or unleashing the extraordinary potential of the human mind, whether you want to find out about the benefits of boredom, the myth of multi-tasking, constant partial stupidity or the sex life of ideas.



Publisher & date: Oakhill Press, 1998
By: Joseph Coates, Andy Hines, John Mahaffie
ISBN: 1886939098

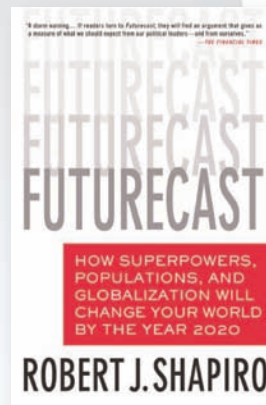
2025

This book is a picture of the world in 2025, as shaped by science and technology and based on forecasts and assumptions about that future world. Four enabling technologies will be central to shaping the world of 2025, each introducing capabilities that will extend far beyond their immediate applications to effect a network of change throughout society, much in the way that the introduction of the electric light and the automobile at the turn of the century powerfully shaped today's world. These four drivers of change are information technology, materials technology, genetics, and energy technology.

A fifth primary driver of change, environmentalism, represents not new capabilities, but a changing worldwide orientation. An emerging pattern of attitudes and beliefs about sustainability and uses of the Earth will direct the shape of the future as powerfully as any of the four enabling technologies.

The world of 2025 can be broken down into three broad population groups: World 1, including the affluent advanced nations of Europe, the United States, and Japan; World 2, the middle, making up the bulk of the world's population, whose immediate needs and resources will be in relative balance; and World 3, the destitute nations, those on the brink of starvation, living with the constant threat of disaster. It is useful to categorize countries within one of these three groups, bearing in mind that by 2025 a worldwide middle class will have emerged, represented to some extent in every society.

In many of the middle-income and destitute nations, an affluent few will make up a thin crust living essentially like those of World 1. World 1 countries may have a corresponding but thin bottom layer of abjectly poor.



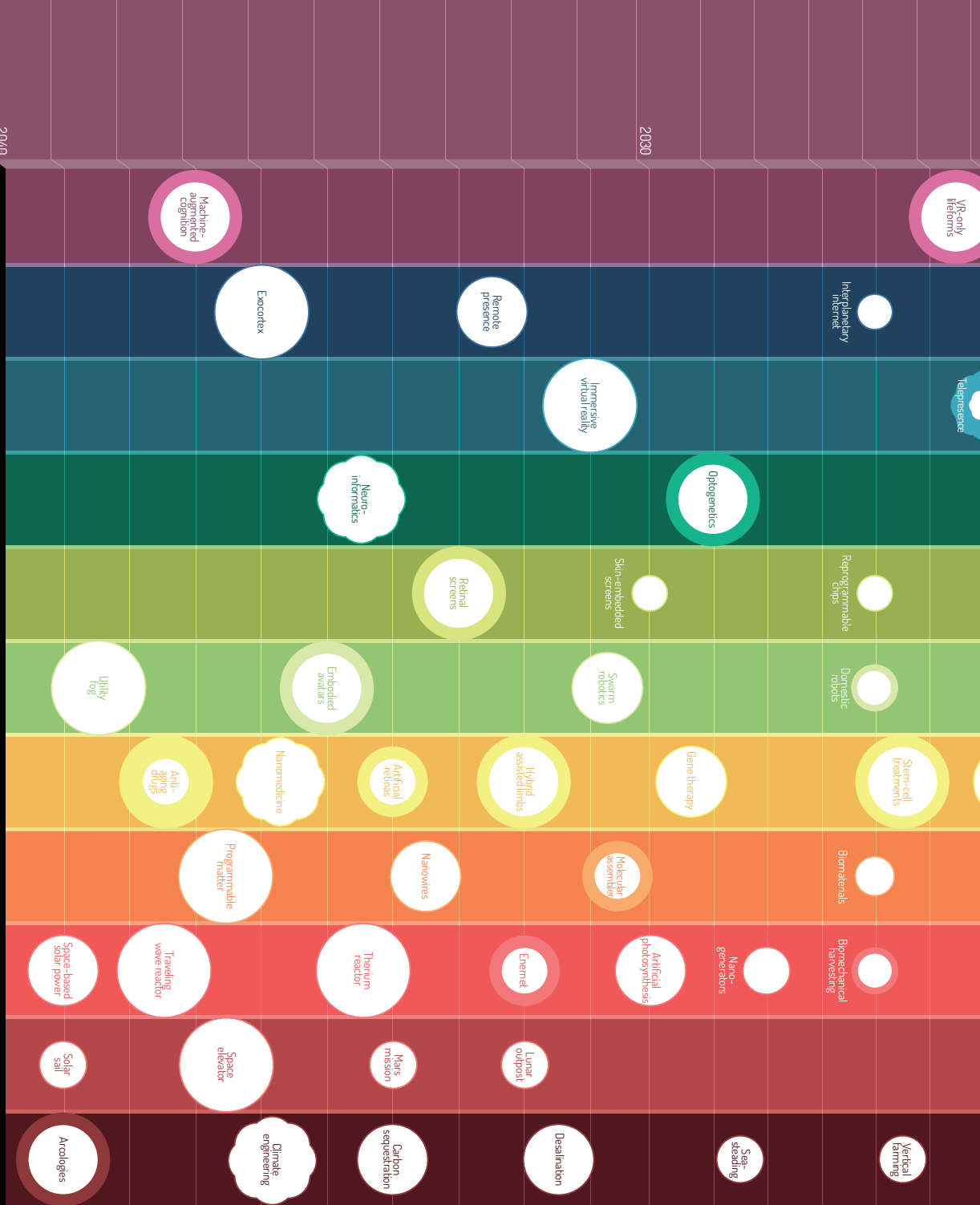
Publisher & date : St. Martin's Griffin Press, 2009
By: Robert J. Shapiro
ISBN: 9780312352424
ISBN: 10. 0312352425

Future Cast

As the world grows increasingly interconnected and inter-related by globalization, economic crisis and new technologies, the answer to this important question depends largely on the paths taken by the world's major nations. In Futurecast, Robert J. Shapiro, a man world leaders and heads of industry look to for straight talk on the global economic, political and financial affairs, sketches the future with a critical eye to tell us what our world will really be like over the next decade. In this brief time, he foresees monumental changes caused by three historic new forces globalization, the aging of societies, and America's role as a sole superpower with no near peer— that will determine the paths of nations and the lives of countless millions.

- The U.S. and China will be the world's two indispensable economies, dominating the course of globalization.
- Globalization will continue to shift heavy manufacturing and millions of high-end service jobs from advanced countries like the U.S., to China, India, Indonesia, Mexico, Romania, Turkey and other developing nations.
- Europe's major nations and Japan will face the prospect of serious economic decline and critical problems in their retirement pension systems, pushing them further towards the periphery of global economic and geopolitical power.
- Every major country—the U.S., Europe, Japan, China—will face critical problems maintaining their health care systems, and the entire world will face a slow-motion crisis over energy supplies and the need to confront climate change.

In an unstable world, Robert Shapiro's Futurecast is a necessary road map to the coming years.



2040

2030

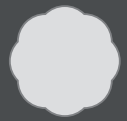
2040

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RELATIVE IMPORTANCE
The node size indicates the predicted importance of a technology.

CONSUMER IMPACT
The outline of a node indicates a consumer impact larger than the technological novelty.

CLUSTER OF TECHNOLOGIES
A jagged outline indicates a cluster of similar technologies grouped together.



Last updated:
2012-02-23

\$1,000 computer reaches the capacity of the human brain
($\approx 10^8$ calculations per second)
Source: <http://bit.ly/BN6QLc>

World population: 8 billion
Source: UN - <http://bit.ly/7nqPLS>

BRICs GDP overtakes the G7
Source: Goldman Sachs - <http://bit.ly/r5dWvg>

Terabit internet speed standard
Source: <http://bit.ly/4P9K4nb>

Exabyte storage standard
Source: <http://bit.ly/4P9K4nb>

MAP THE FUTURE

As a strategic policymaker or stakeholder, you can help map out a desired future for Malaysia

This is an invitation by myForesight® to build a collective future. Do you find this magazine thought-provoking? Do you think we could have done better? Perhaps you would like us to cover a specific angle in the study of Foresight.

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We look forward to hearing from you.

myForesight® team

