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MALAYSIA'S NATIONAL FORESIGHT MAGAZINE

FORESIGHT AREAS UNVEILED

Understanding The Drivers of Change

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AAT

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features

editor's note

Initial Thoughts

BY
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The dilemma in trying to predict, understand as well as react to technological changes of the future, is that there is a need to understand the drivers of change which extend far beyond the domains of science and technology. In undertaking this effort, it is required to include a range of discipline **involving the systematic study of science, social science and even the humanities as well as to draw upon the experience of those more directly engaged with the economy and society in industry, government and beyond.**

There is a need to create a systematic structure to enable contributors or participants to channel their knowledge and experience in a creative manner, not confined by short-term interests, biased opinions or prejudices. The process of designing and implementing these activities is called **Foresight**.

If you are reading this, you will be aware that a National Foresight initiative was conducted with the objective of identifying and prioritizing technology areas for Malaysia. Various engagement sessions were held to provide stakeholders.

It is worth to note that stakeholder's engagement in some of the programmes was overwhelming that changes were required to be made on how the programme was to be conducted as well as requirement of larger venue for workshops and focus groups. This demonstrates there is interest in foresight activities as well as the willingness of participants to contribute and channel their knowledge and experience for the national wellbeing.

Therefore in this issue, we are unveiling the outcome of the foresight engagement; areas that were identified as important to Malaysia in the future; areas that the stakeholders feel significant towards creating a sustainable Malaysia in meeting the challenges and objectives of New Economic Model and Vision 2020.

Since the beginning of the year we have already presented this to certain quarters and already we're receiving feedback. We welcome these. Since foresight is a continuous process, the feedback received will assist us in refining these areas. We are also glad to see there are already uptakes on the focus areas in the horizon.

During the course of presenting the findings, we were asked; How did we get to this conclusion? What methods were used?

Well the methods that were chosen signify the needs to cater its adoption to Malaysia's case studies. Therefore the selection and combination of methods are made to ensure the best outcome and participation of stakeholders in Malaysia. This includes but not limited to the following:-

- The need to educate potential stakeholders on the benefits and potential impact of foresight;
- To negate the relatively high level of cynicism of the stakeholders;
- To enable change of thinking and mind set, thinking of the futures rather than today;
- To inculcate and incorporate discipline and subjectivity. This includes receptiveness towards methods and systematic approaches of foresight;
- To ensure engagement of diverse and equal distribution of participants;
- The need to sustain continued interest in the foresight exercises by introducing creative and participatory approaches;
- Enabling use of multi tools environment (social networking sites; online forum etc.)

Further insights on methods available on foresight and how it is chosen are covered by Rafael Popper's 'Critical Factors Inf uencing The Selection of Foresight Methods'. We believe this this will provide an interesting reading for those interested in conducting their own foresight.

You would also be able to see how foresight contributes significantly in a country S&T Planning. Hyun Yim's article provides an insight how this was achieved in South Korea.

It is worth to note that further stakeholders engagement will be conducted for the rest of 2011. We will be embarking on a nationwide engagement with the youth. We firmly believe that we can't really talk about the future without talking to those who will be there in the first place. We will also be conducting foresight workshops and focus groups in selected areas of interest and perhaps will be calling on you to participate. To date we have started to embark on initial work on both natural fibres as well as rail.

We know that after going through the magazine you will have formed your opinion on certain matters. We want to hear them. We welcome your feedback and contribution.

I am sure you will find the magazine beneficial and worth your time.

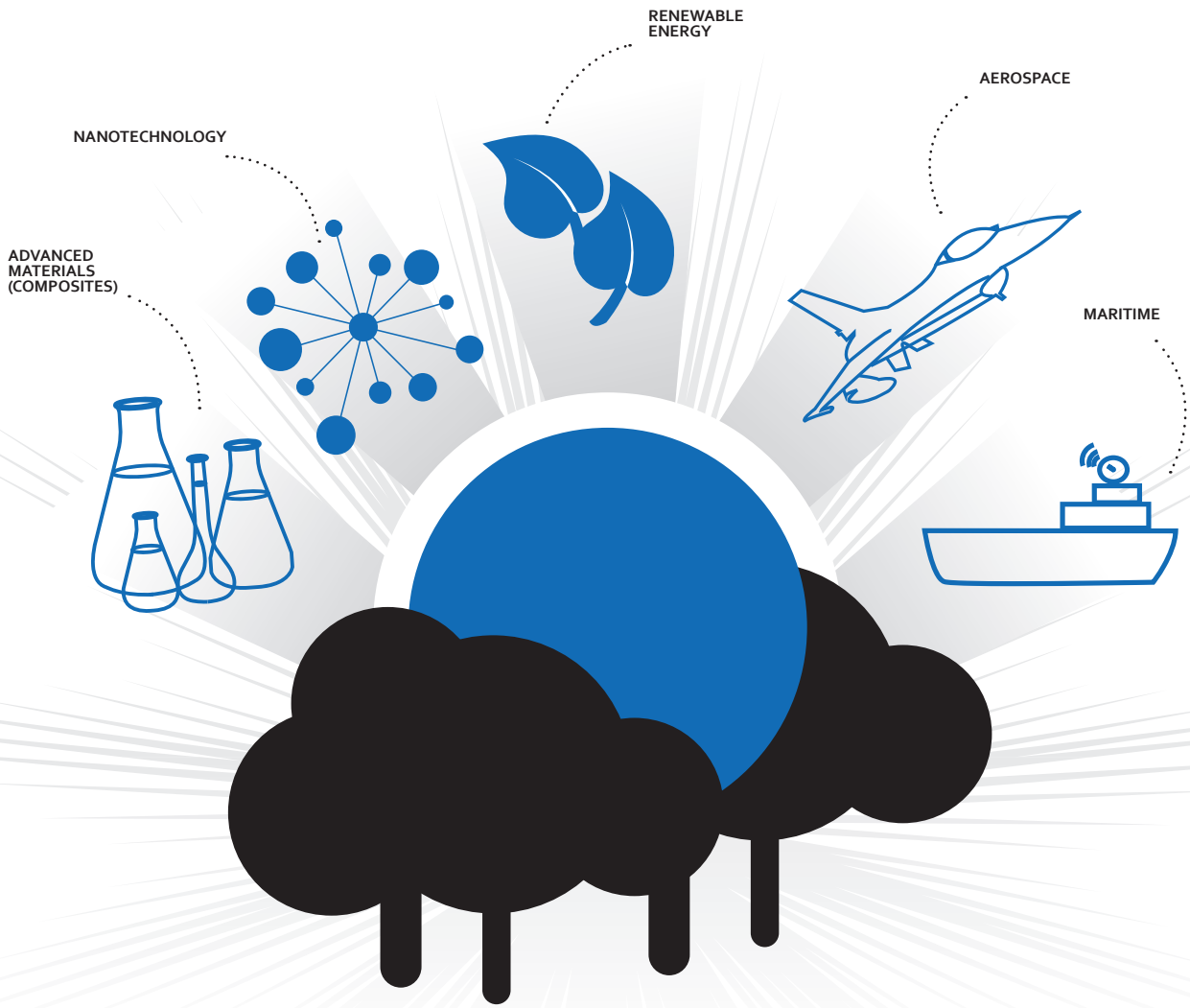
Rushdi Abdul Rahim

editor's note

There is a need to create a systematic structure to enable contributors or participants to channel their knowledge and experience in a creative manner, not confined by short-term interests, biased opinions or prejudices.

Photo Credit: Sven Golz

leader's insights



Time To Reignite
A Science Renaissance

BY
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Joint Chairman – Government, MIGHT.

Experience has shown that countries that grow rich are not necessarily those well-endowed with natural resources but those that invest wisely in building their human capital and allocating a reasonable percentage of their gross domestic product to research and development.

As we celebrate our 53rd Merdeka, it is also appropriate to reflect on what role science can play in building our national prosperity.

There used to be a time when science flourished in this country and contributed to wealth creation, although it was misdirected and catered to a different stakeholder. During the colonial era, several research institutions were established to enrich the British empire or to take care of the well-being of our then political masters.

The Institute of Medical Research was established in 1901 to address the hazards posed by tropical diseases prevailing at that time, malaria being one of them.

To meet the needs of an increasing population due partly to an influx of immigrant labourers, and to fill the coffers of the colonial government through export of agricultural produce, the Department of Agriculture was founded in 1905. To help exploit our abundant and pristine biological diversity at that time, especially the extraction of timber, the Forest Research Institute of Malaya was launched in 1926.

In one of the earliest episodes of bio-piracy, in 1876, Henry Wickham, an Englishman, smuggled 70,000 rubber seeds out of Brazil to be germinated at Kew Gardens near London, a despicable act but still deserving of a knighthood from Queen Victoria. Some of the seedlings were despatched to the Far East for large-scale planting.

To support the fledgling rubber industry, the Rubber Research Institute of Malaya (RRIM) was founded in 1926. The then Malaya and later Malaysia was the top rubber producing country in the world for many years, because of the excellent research and development conducted at RRIM. Rubber remained a top revenue earner for the country in the early years after Merdeka.

There is an urgent need for a revamp of our science governance and research priority-setting

Oil palm, originally from West Africa, was first introduced to Malaya in 1910 by Scotsman William Sime and English banker Henry Darby. The first plantations were established by colonial owners such as Sime Darby. These companies were "Malaysianised" in the 1970s.

Science had a hand in creating wealth through oil palm cultivation. Research, which was earlier conducted by the plantation houses, received a boost with the establishment of the Palm Oil Research Institute of Malaysia (PORIM) in 1979.

PORIM (renamed Malaysian Palm Oil Board in 2000) is a public-private-coordinated institution with an impressive rate of technology commercialisation at 30.6 per cent (compared with 3.4 per cent among local universities).

Time and circumstances have changed. Agro-based economic activities no longer constitute the bulk of our national prosperity. The export-oriented electrical and electronics industries located in the free trade zones brought a lot of revenue in the 1970s and 1980s but may not be tenable much longer, given the increasing competition from our cheaper-cost neighbours. Petroleum is a major source of income but this source of wealth is finite.

It is time to venture into other wealth-creating pursuits. The dawn of the 21st century has brought with it advances in information and communication technology and emerging technologies such as biotechnology, nanotechnology and the green technologies. However, these are all knowledge-intensive activities.

We need to prepare and equip our people well. Experience has shown that countries that grow rich are not necessarily those well-endowed with natural resources but those that invest wisely in building their human capital and allocating a reasonable percentage of their gross domestic product to research and development.

Indeed, a 2007 World Bank Report suggested that "Malaysia needs an economy where science, technology and engineering are integrated into the production process and where creativity, imagination, knowledge and design capability are embodied in well-educated skilled workers who are the main source of national prosperity and wealth".

Vision 2020 and the New Economic Model cannot be premised on low-cost, low-tech mass production but need to be driven by cutting-edge technologies underpinned by a strong R&D and innovation base.

We have embarked on that road. However, it has been a halting start. Notwithstanding that our policymakers are aware of the potential of science, technology and innovation in wealth creation, and national targets have been well set, these targets are somewhat off the mark for the moment.

There is an urgent need for a revamp of our science governance and research priority-setting. For example, although R&D spending of 1.5 per cent of gross domestic product was targeted in the Ninth Malaysia Plan, the gross expenditure on R&D in 2008 was a low 0.21 per cent, a dismal figure compared with the R&D spending of countries like Japan (3.32 per cent), South Korea (3.22 per cent) and Singapore (2.77 per cent).

Our efforts to increase the number of researchers to 50 per 10,000 workers were also not realised: the current figure stands at 20.3 per 10,000, compared with South Korea's 89.8 and Singapore's 103.

It is timely, therefore, as recently announced in the 10th Malaysia Plan, that the government intends to establish the National Science and Research Council, an apex body mandated to provide advice, set priorities and streamline R&D activities.

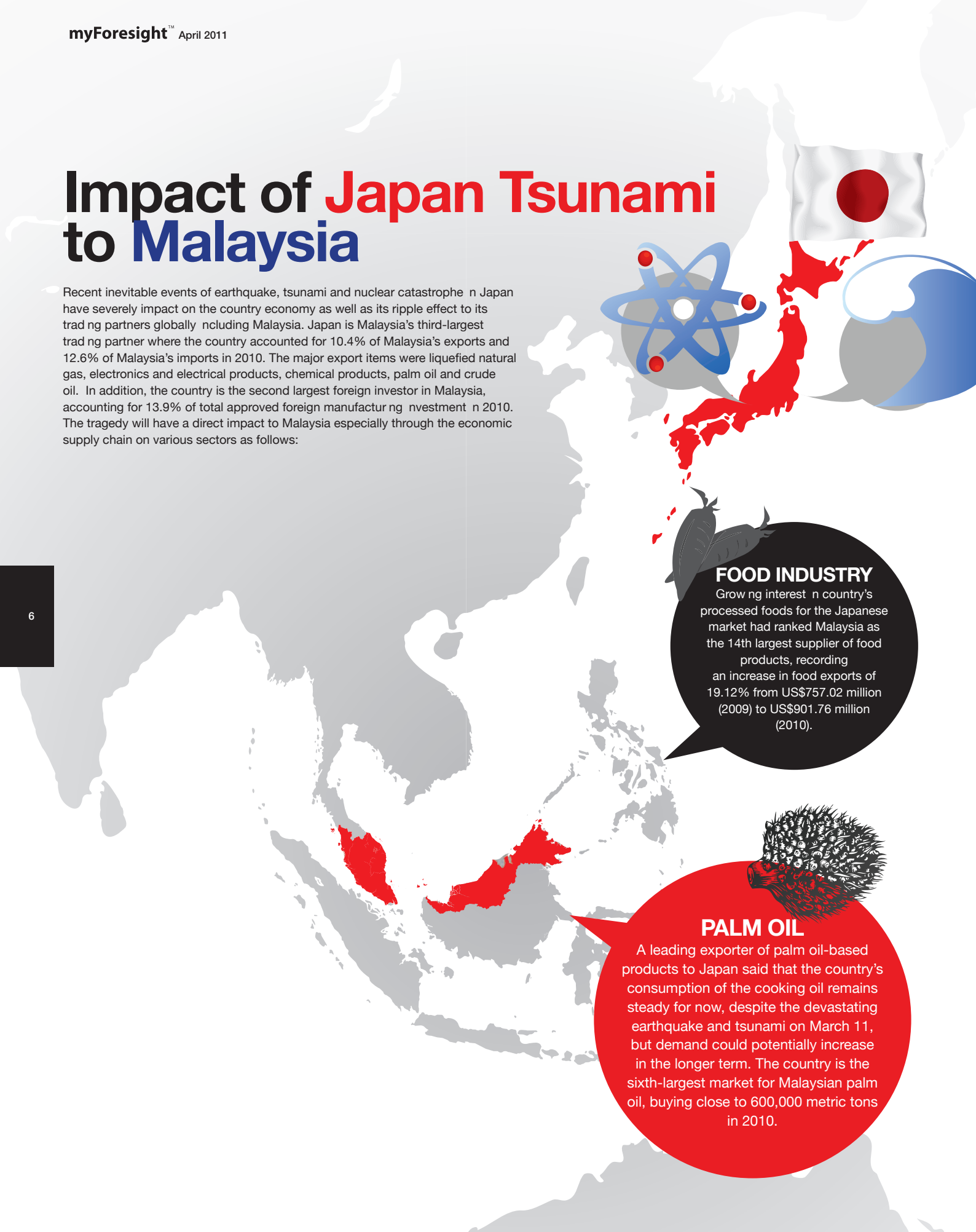
This is a strong signal to researchers in the public sector and partners in the corporate world that the government recognises the crucial role that science in general and R&D, in particular, play in building a prosperous and peaceful nation.

Let us work together to reignite the fire for a science renaissance in this country.

This article was published in The News Straits Times, 3 September 2010.

Impact of Japan Tsunami to Malaysia

Recent inevitable events of earthquake, tsunami and nuclear catastrophe n Japan have severely impact on the country economy as well as its ripple effect to its trad ng partners globally ncluding Malaysia. Japan is Malaysia's third-largest trad ng partner where the country accounted for 10.4% of Malaysia's exports and 12.6% of Malaysia's imports in 2010. The major export items were liquefied natural gas, electronics and electrical products, chemical products, palm oil and crude oil. In addition, the country is the second largest foreign investor in Malaysia, accounting for 13.9% of total approved foreign manufactur ng nvestment n 2010. The tragedy will have a direct impact to Malaysia especially through the economic supply chain on various sectors as follows:



FOOD INDUSTRY

Grow ng interest n country's processed foods for the Japanese market had ranked Malaysia as the 14th largest supplier of food products, recording an increase in food exports of 19.12% from US$757.02 million (2009) to US$901.76 million (2010).

PALM OIL

A leading exporter of palm oil-based products to Japan said that the country's consumption of the cooking oil remains steady for now, despite the devastating earthquake and tsunami on March 11, but demand could potentially increase in the longer term. The country is the sixth-largest market for Malaysian palm oil, buying close to 600,000 metric tons in 2010.

OIL & GAS

With about 25% of Japan's electricity coming from nuclear, the resulted power shortage due to closures of numerous nuclear reactors following the quake suggests imports of petroleum products and other energy sources should pick up. Relying heavily on coal and natural gas on the country's power generation, it is expected that diesel imports for power generators to step-up and that of other petroleum products s nce part of its domestic production is offl ne. Alongside will be the demand for natural gas/LNG and coal.

TIMBER INDUSTRY

Timber will be the d rect beneficiary. Local t mber companies will be the main beneficiary when Japans starts to rebuild the earthquake disaster areas as Malaysia is their largest plywood exporter accounting for 48% of Japan's total plywood. Japan mports more than 50% of the total plywood for its consumption.

ELECTRICAL & ELECTRONICS

Electrical and electronics sector n Malaysia may be hurt as many companies may face difficulty getting the r supply of components. Confirmation from Sony that its Sendai Technology Center in Tagaiyo (Miyagi Prefecture) was severely damaged in the magnitude 9.0 earthquake that struck near there. The plant was the only facility in the world capable of manufacturing most of Sony's professional media products.

AUTOMOTIVE SECTOR

Major car producers n Japan have temporarily stopped their production resulted breakdown in supply of automotive parts and new complete built up (CBU) from Japan. Although impact to Malaysia is minimal, as major local car makers are sourc ng most completely knocked down (CKD) parts from Thailand and Indonesia as well as hold ng sufficiently number of cars n the inventory to cater local demand.

AVIATION SECTOR

According to International A r Transport Association (IATA), Japan produces between 3 per cent and 4 per cent of global jet fuel supply. With the loss of some refinery capacity due the earthquake could contribute to the increase of jet fuel prices. In addition, fear of radioactive leaks will force large number of air travellers to Japan to cancel the r plan will have negatively impact the tourism industry of both countries.

MARINE PRODUCTS

The nuclear radiation of iod ne has been detected, shifting the market value of Japanese seaweed. Malaysia's largest sushi restaurant cha n -- Sushi King announced that it has temporarily stopped importing raw food from Japan for fear over possible radioactive contamination. Sushi K ng mports 23 per cent of their raw food from Japan -- mainly noodles, miso soup powder and tea powder.

Foresight Areas Unveiled

BY
MOHD NURUL AZAMMI

Strategic Industry Partners

Strategic Policy & Content Partners

National Technology Foresight 2010

BACKGROUND

Malaysia aims to be a high-income nation which is sustainable and inclusive by the year 2020, as projected in the National Economic Model (NEM). The Government has put in tremendous effort in making the aspiration a reality through a number of strategic plans such as Economic Transformation Programme (ETP), Government Transformation Programme (GTP) as well as the 10th and 11th Malaysia Plan. Year 2020 is about nine (9) years ahead from now and the plans have been reported to be progressing well with on-going implementation of more than 130 Entry Point Projects (EPPs) and other supporting initiatives. However, what will be the aspiration for Malaysia beyond the year 2020? How does the country prepare and position itself from now to maintain its growth momentum taking into cognisance the dynamic changes of the future global environment?

"There is a need for a system to detect in advance weak signals, monitor trends, analyse all possible drivers of change, identify future niche areas and technology requirements and others that will facilitate today's decision makers to design the path for the best direction in the next 20 years as well as to position the country to face any possible challenges along the journey." All of these activities are referred as **Foresight**. In view of its importance, most of developed countries such as US, UK, Korea, Japan, Taiwan, to name a few, have already embarked and leveraged on Foresight to chart their future national development. Therefore for Malaysia, the Malaysian Industry-Government Group for High Technology (MIGHT) on behalf of Ministry of Science, Technology & Innovation (MOSTI) took an initiative to undertake the National Technology Foresight 2010 (NTF 2010) program. The six (6) months program focused on systematically identifying and assessing potential sectors in Science, Technology and Innovation (STI) important to Malaysia in the next 10 years. During the period of the study, multiple activities incorporating various methods that are prominently used in Foresight were conducted and customised to Malaysia's case studies.

Throughout the process, the engagement with the relevant stakeholders was crucial and their participation in the programmes was over whelming. This in itself was a clear demonstration of their interest in foresight activities as well as their willingness to participate, contribute and channel their knowledge and experience for national wellbeing. Below are **highlights** of the stakeholders that participated in the foresight activities. Representatives from these organizations were ever-present in the workshops and focus groups sessions. This list is not definitive and not exhaustive.

The engagement was meant to identify STI areas of priorities by systematically looking at the issues, trends as well as drivers for the future. Plausible scenarios were then created to enable the identification of technology priorities that is required to support the nation's vision 2020.

OUTCOME

The engagement was meant to identify STI areas of priorities by systematically looking at the issues, trends as well as drivers for the future. Plausible scenarios were then created to enable the identification of technology priorities that is required to support the nation's vision 2020.

Common themes were developed whereby the technology identified must fulfil one or more of the following criteria:-

1. The stakeholders unanimously agreed that any development of technology must be **green and environmentally friendly**.

2. In moving forward, the technology identified must contribute towards easy **mobility**. This includes the technology and the science of making things smaller for ease of movement as well as enabling efficient transport of things.

3. Any technology developed or acquired must be **modular** and scalable to meet the needs of the future. Hence the technology growth could be strategically planned and adopted accordingly.

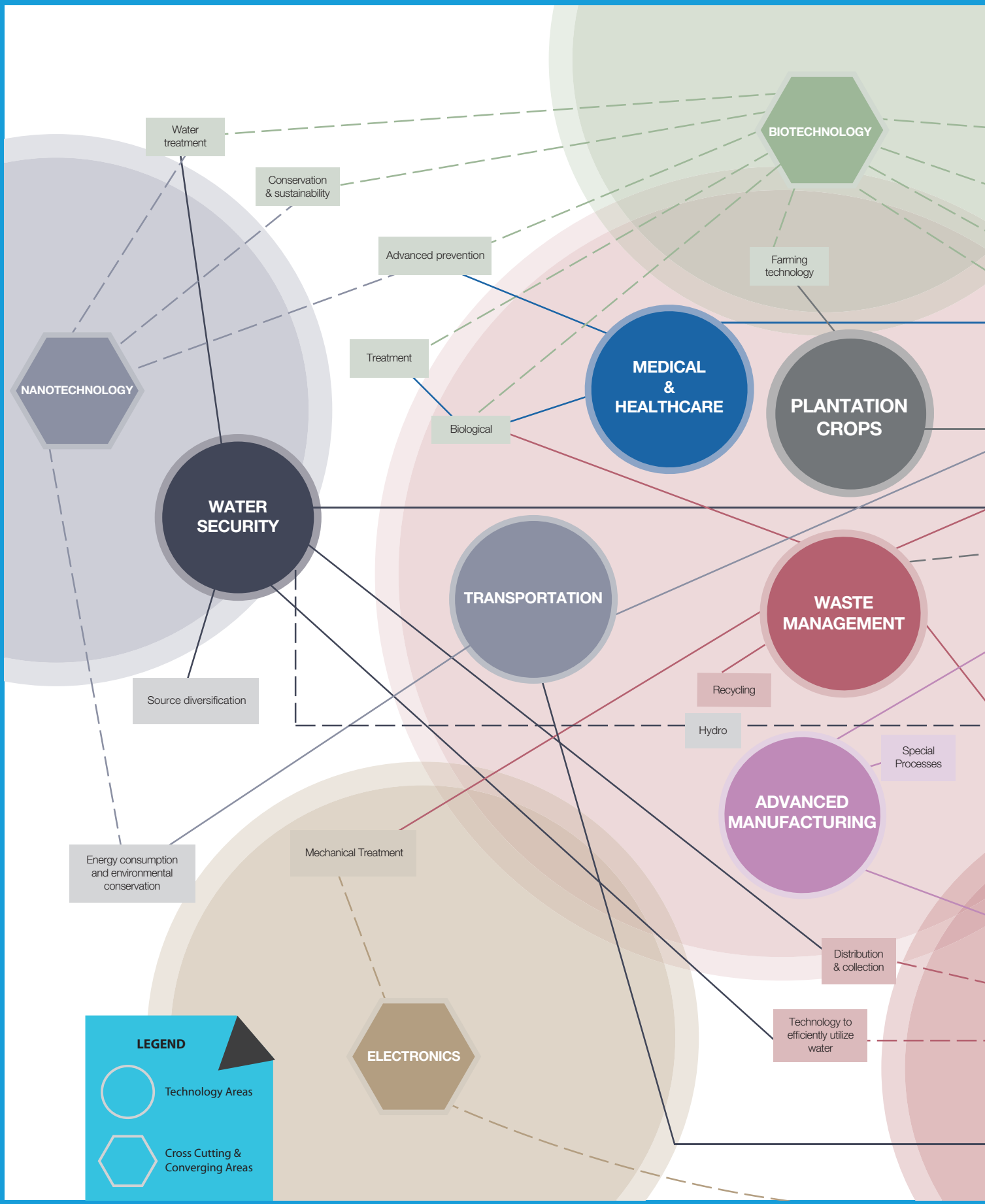
4. Emphasis on security was raised by the stakeholders whereby any technology developed or acquired must be secure or contributes towards the future **security** of the nation.

Guided by the theme, the foresight initiatives have identified nine (9) technology areas which Malaysia should give priority to drive future growth. The nine (9) technology areas identified are:

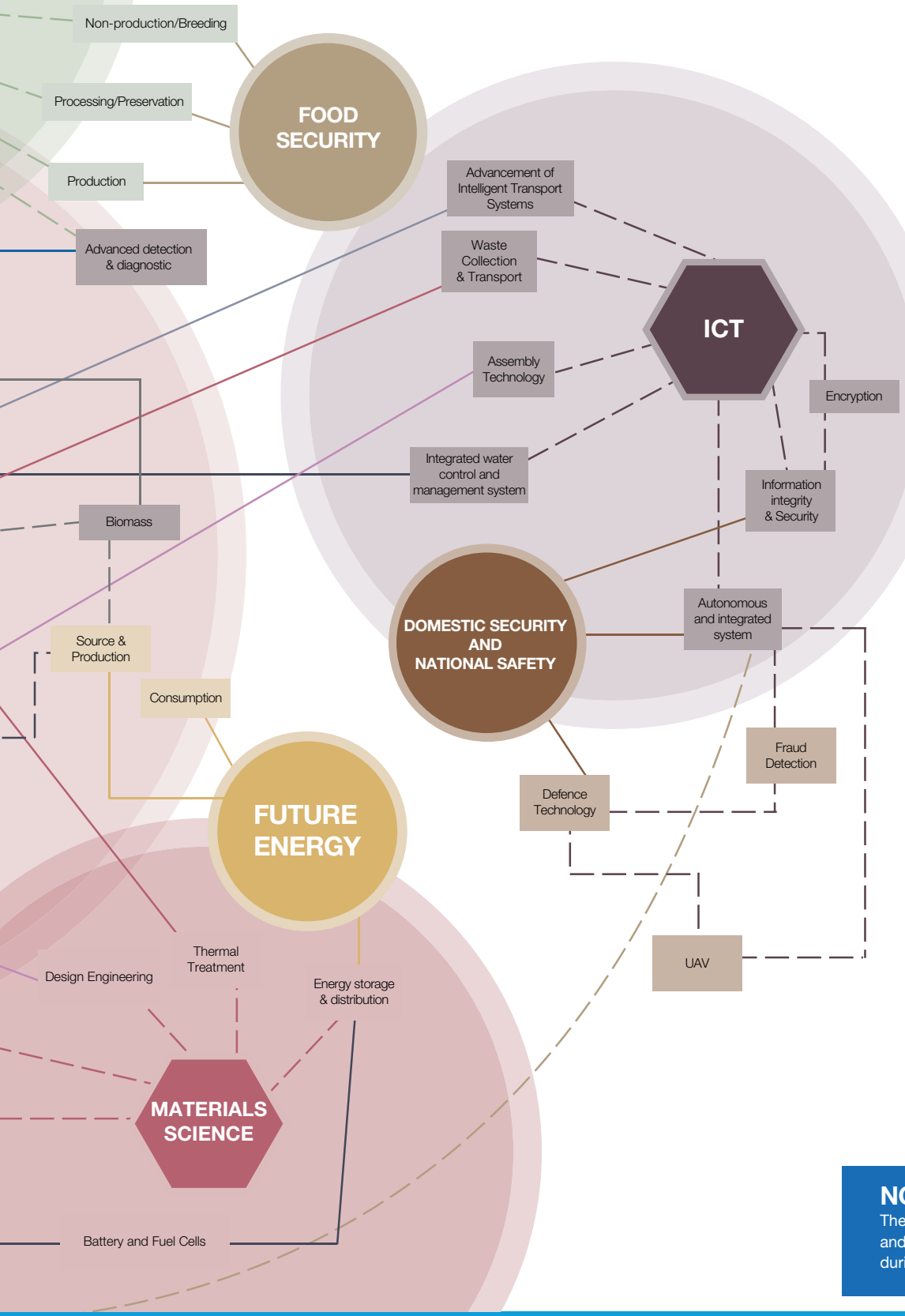
1. Advanced Manufacturing;
2. Domestic Security and National Safety;
3. Environmental Management;
4. Food Security;
5. Future Energy;
6. Medical & Healthcare;
7. Plantation Crops;
8. Transportation;
9. Water Security.

In addition, a further five (5) areas have been identified as a cross cutting and converging areas whereby development of these technology areas will have an effect on multiple sectors and areas as well as it wide ranging and cross cutting applications. The five (5) cross cutting and converging areas are:-

1. Biotechnology
2. Electronics
3. ICT
4. Materials Science
5. Nanotechnology


Water treatment
Conservation & sustainability
BIOTECHNOLOGY
Advanced prevention
Farming technology
NANOTECHNOLOGY
Treatment
MEDICAL & HEALTHCARE
PLANTATION CROPS
Biological
WATER SECURITY
TRANSPORTATION
WASTE MANAGEMENT
Source diversification
Recycling
Hydro
Special Processes
ADVANCED MANUFACTURING
Energy consumption and environmental conservation
Mechanical Treatment
Distribution & collection
Technology to efficiently utilize water
ELECTRONICS
LEGEND
Technology Areas
Cross Cutting & Converging Areas

Technology Areas



NOTES

The technology list is not definitive and further detail ng shall be done during sectoral foresight exercise.

The InterConnect Series 2010/2011

8 DECEMBER
Executive Talk:
Strategic Intelligence by Dr. Jonathan L. Calof

22 DECEMBER
Focus Group Session:
Biotechnology

19 JANUARY
Focus Group Session:
Water

8 FEBRUARY
Focus Group Session:
Advanced Manufacturing

10 FEBRUARY
Focus Group Session:
Electronics

16-17 MARCH
FiberSight 2011
International Natural Fiber Organisation "Growing Together 2020"

Critical Factors Influencing The Selection of Foresight Methods

BY
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HIGHLIGHTS

Objective – *This publication deals with a challenging topic, which in both academic and professional literatures have been widely discussed but mainly from one single angle, that is, how to select foresight methods? From that point of view researchers and consultants promote (even if unintentionally) the use of particular methods. Here the question of selection is raised from a different perspective: how are foresight methods selected?*

Scope – *The guiding 'theory' is that a better understanding of the fundamental attributes of foresight methods and their linkages to the core phases of a foresight process, together with the identification of possible patterns in the selection of methods, will provide useful insights as to how the selection of methods is carried out.*

Results – *So far the selection of foresight methods has been dominated by the intuition, insight, impulsiveness and – sometimes – inexperience or irresponsibility of practitioners and organisers. This paper reveals that the selection of foresight methods (even if not always coherent or systematic) is a multi-factor process, and needs to be considered as such.*

Potential uses – *The results can be utilised by lecturers and students to better describe and understand foresight methods use, and by organisers of foresight (including practitioners) to better inform decisions during the design of (hopefully) more coherent methodological frameworks.*

Main contributions – *The paper combines practical concepts and frameworks (such as the SMART Foresight Process and the Foresight Diamond) with innovative analyses to better represent and visualise the combination of methods in 886 case studies, e.g. introducing the Methods Combination Matrix (MCM) to examine the dynamics of methods mix.*

Key terms: *Research methods, Design, Forward planning, Strategic planning, Creative Thinking, Decision making, SNA*

OPENING REMARKS

This paper is based on – and slightly updates – the "How are foresight methods selected?" publication (Popper, 2008). The original paper was published in the *foresight* journal and in 2009 was chosen as an Outstanding Paper Award Winner at the Literati Network Awards for Excellence. The paper uses key outputs of the European Foresight Platform (EFP) [1] activities – especially the *Mapping Foresight* report (Popper, 2009)[2] – and a sister initiative carried out in Spanish by the SELF-RULE network [3]. After four years of systematically researching nearly 2,000 foresight exercises from around the world, these monitoring activities have built up databases[4] of case studies that offer tremendous potential to better understand global foresight practices. This research process, here and after referred to as *mapping*, has consisted of four major activities:

- In the first instance, foresight studies were identified by dedicated network partners, who continuously searched the Internet, public reports, etc. In addition, national correspondents were mobilised and invited to suggest studies on an annual basis.
- The second activity was the actual *mapping* or data entry, using a set of indicators to capture the different elements of a *foresight process* (e.g. methods, country or world region, territorial scale, time horizon and type of sponsorship, among others). From the almost 2,000 cases identified, about half have been fully mapped against the majority of indicators.
- The third activity was the quality control of the data. This task involved sending automated emails with a direct link to the database so that national correspondents could update and improve the quality of mapped cases. This approach had mixed results, so that some exercises are much better mapped than others.
- Finally, the fourth activity involved processing, experimentation and analysis of the data set. These analyses have been used to prepare *annual mapping reports* (ibid.) which have been openly shared with the foresight community and have set the basis for the questions and hypotheses addressed in this article.

To begin with, this paper is based on a sample of 886 foresight studies: *36 cases* looking at Europe, Africa or Asia as a whole, thus considered supra-national studies; and *850 cases* linked to specific countries and including a mix of sub-national, national and supra-national experiences. But given that much foresight is increasingly embedded (see Salo and Salmenkaita, 2002) in wider research and development (R&D) policies, in this paper the country-related studies are clustered into seven *geo-R&D contexts* – taking into account the country's geographic location and its gross expenditure on R&D (GERD) as percentage of GDP (European

experts' insights

Commission, 2007). [5] As a result, the country-related sample includes:

- 313 cases from three *High-R&D* groups with R&D intensities above 2.4% of GDP – consisting of 174 cases from *Europe* (Austria, Denmark, Finland, France, Germany, Iceland, Israel, Sweden and Switzerland); 109 cases from *North America* (Canada and United States); and 30 cases from *Asia* (Japan and South Korea).

- 313 cases from two *Medium-R&D groups* with R&D intensities between 1.5% and 2.2% of GDP – consisting of 299 cases from *Europe* (Belgium, Luxembourg, Netherlands, Norway and the United Kingdom); and 14 cases from *Australia*.

- 224 cases from two *Lower-R&D groups* with R&D intensities below 1.5% of GDP – consisting of 110 cases from *Europe* (Bulgaria, Cyprus, Czech Republic, Estonia, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Turkey) and 114 cases from *South America* (Argentina, Brazil, Chile, Colombia, Peru and Venezuela).

However, the reader should be aware of limitations with the databases. To begin with, the *mapping* of foresight has to contend with inevitable biases, such as language and the high visibility of national level activities. These have implications for the *mapping* data collected, with some types of activities, e.g. sub-national foresight, under-represented in the database. Moreover, data has been collected by a network of correspondents, which, given that some of the indicators used are open to interpretation, has sometimes resulted in a lack of consistency in *mapping*. Some of these challenges are difficult to fully resolve, but the data could be much improved if a more targeted monitoring strategy was undertaken to better cover the sub-national level, for example. At the same time, some countries where foresight is also practiced have been insufficiently monitored so that their foresight activity is under-represented in our data, for example China, India, Taiwan and Mexico. There are other limitations of the *mapping* that have motivated the above mentioned quality control. Some have to do with *problems of inclusion* (where very small visioning or strategic planning studies have been mapped as foresight); others with *problems of exclusion* (where the body of work in a particular sector is underrepresented, such as: private sector foresight; work on skills, jobs and occupations; or studies on the military and defence sectors, for example).

Having both these possibilities and limitations in mind, the *mapping* still offers a unique opportunity to unlock information on a wide range of issues about foresight practices in the world. This information is here used to address a challenging topic, which in both academic and professional literatures have been widely discussed but mainly from one single angle, that is, how to select foresight methods? From that perspective researchers and consultants promote (even if unintentionally) the use of particular methods. In this paper, instead, the question of selection is raised from a different viewpoint: *how are foresight methods selected?* The guiding 'theory' is that a better understanding of the fundamental *attributes* of foresight methods and their linkages to the core phases of a *foresight process*, together with the identification of possible patterns and relationships, will provide useful insights as to how the selection of methods is carried out.

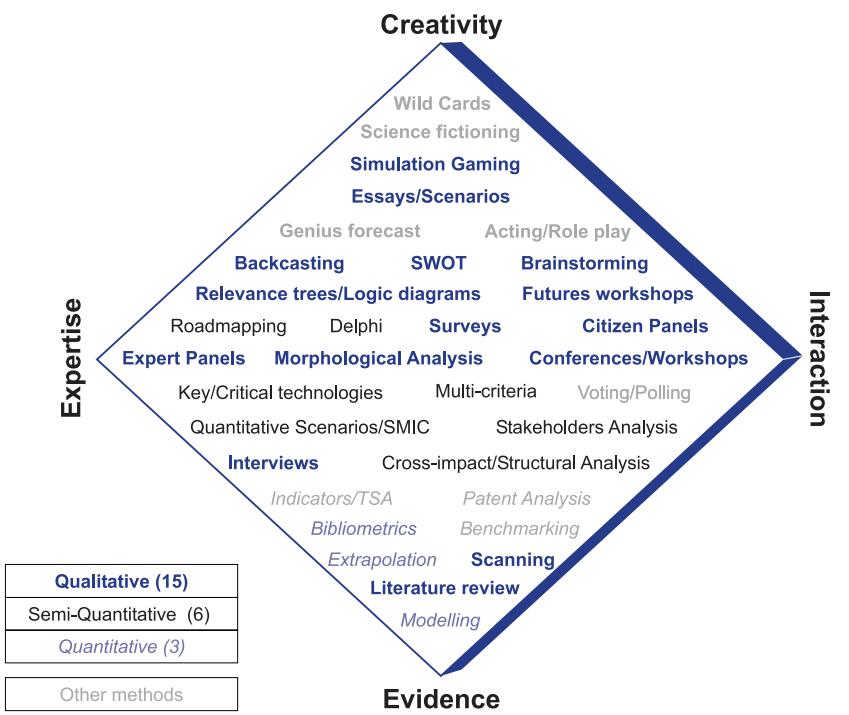
Two interconnected hypotheses are tested in this article:

- The first hypothesis is that *methods* are chosen based on their *'intrinsic attributes'*, such as their *nature* (i.e. qualitative, quantitative or semi-quantitative) and their *capabilities* (i.e. the ability to gather or process information based on evidence, expertise, interaction or creativity), for example.

- The second is that *methods are chosen based on fundamental elements and conditions influencing the foresight process*, in other words, *foresight process needs* matter. This idea is not radically new, but has remained no more than a reasonable conjecture up until now, mainly 'validated' through practice or tacit knowledge and yet to be proven.

Of course, in both *futures* and *foresight* literatures there have been plenty of discussions about processes, generations, challenges, classifications and various 'styles' of forward-looking practices and methods (De Jouvenel, 1967; Boucher, 1977; Coates, 1985; Jungk and Müllert, 1987; Cameron et al., 1996; Bell, 1997; Glenn and Gordon, 1999; Godet, 2000, 2001; Georghiou, 2001; Masini, 2001; Miles, 2002, 2008; Cuhls, 2003; Voros, 2003, 2005; Kaivo-oja et al., 2004; Bishop et al., 2007; Barré, 2008; Popper 2008; Popper and Medina, 2008; Johnston and Sripaipan, 2008; Keenan and Miles, 2008; and Keenan and Popper *in this volume*). Even though these and many other contributions provide a huge 'knowledge base' of definitions, frameworks and experiences using a wide range of real – and occasionally hypothetical – examples, up until now there has not been a systematic and organised effort to explain 'how are foresight methods selected' using such a large number of case studies.

Figure1 The Foresight Diamond (Popper, 2008)



With this in mind, a deductive approach will be taken to analyse the *mapping* data and to present it in various ways so that the hypotheses above are confirmed or rejected. The paper is structured around four sections. After these opening remarks, there is a section describing the above mentioned attributes of foresight methods and their expected contribution to the five core phases of a *SMART foresight process* (Scoping, Mobilising, Anticipating, Recommending and Transforming). Here is where the eleven elements considered and analysed throughout the paper will be introduced (Section 2). This is followed by a section on key findings, which uses a sample of 886 case studies to show how the previously described elements influence the selection of foresight methods (Section 3). Finally, Section 4 concludes with a snapshot summary of major findings.

FRAMING ELEMENTS

This section describes a number of framing elements related to the hypotheses tested in this article. It basically sets the context for the various assumptions made in the paper by describing and exploring the various influencing factors on the selection of foresight methods.

Fundamental attributes of foresight methods

Let us begin by describing two fundamental 'attributes' of foresight methods (see Annexe): *nature* and *capabilities*. With regards to their nature, methods can be characterised as qualitative, quantitative or semi-quantitative:

- *Qualitative methods* generally provide meaning to events and perceptions. Such interpretations tend to be based on subjectivity or creativity that is often difficult to corroborate, e.g. opinions, judgements, beliefs, attitudes, etc. In the *mapping* fifteen qualitative methods have been included: *backcasting; brainstorming; citizens panels; environmental scanning; essays; expert panels; futures workshops; gaming; interviews; literature review (LR); morphological analysis; questionnaires/surveys; relevance trees; scenarios; and SWOT analysis.*

- *Quantitative methods* generally measure variables and apply statistical analyses, using or generating – at least in theory – reliable and valid data, such as socio-economic indicators. The *mapping* considered three quantitative methods: *bibliometrics; modelling/simulation and trend extrapolation/megatrends* (or simply *extrapolation*).

- *Semi-quantitative methods* are basically those that apply mathematical principles to quantify subjectivity, rational judgements and viewpoints of experts and commentators, i.e. weighting opinions and probabilities. The *mapping* included six methods from this category: *cross-impact/structural analysis; Delphi; key technologies; multi-criteria analysis; stakeholder mapping* and *(technology) roadmapping*.

A category labelled *'other methods'* was also included in *mapping*. This was often used to indicate if an exercise applied methods like *benchmarking* and *patent analysis*, among others.

The second attribute refers to the *capabilities* of methods, in other words, the ability to gather or process information based on evidence, expertise, interaction or creativity. These attributes are not exclusive or restrictive; in fact, they could be better understood if presented as 'genetic' components of a method. Using the same analogy, the 'genetic structure' of an activity carried out using *expert panels* could be estimated as consisting of:

70% expertise + 10% evidence + 10% creativity + 10% interaction.

While the same activity carried out using *Citizens Panels* could consist of:

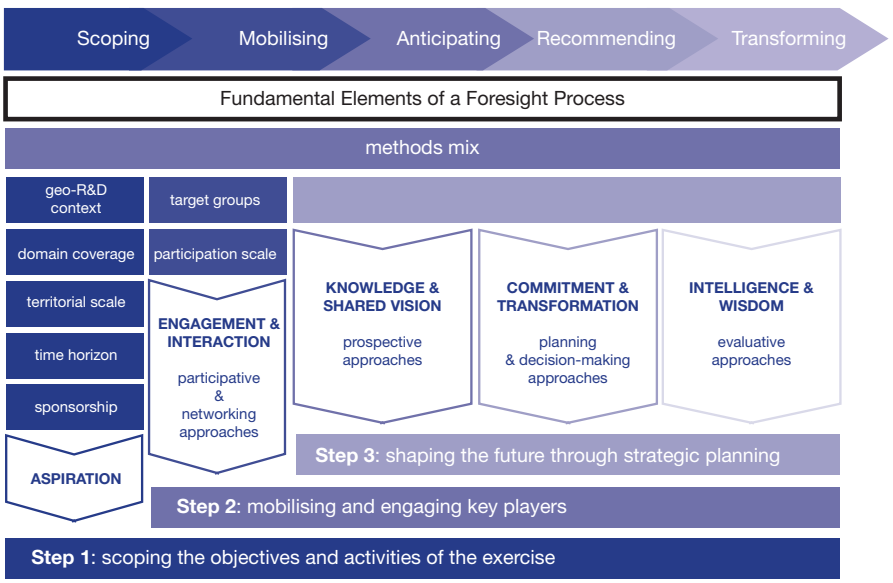
10% expertise + 10% evidence + 10% creativity + 70% interaction.

So let us briefly describe each of these attributes:[6]

- *Creativity* refers to the mixture of original and imaginative thinking and is often provided by artists or technology 'gurus', for example. These methods rely heavily on the inventiveness and ingenuity of very skilled individuals, such as science fiction writers or the inspiration that emerges from groups of people involved in *brainstorming* sessions (see also Ansoff, 1975; Cassingena Harper and Pace, 2004).

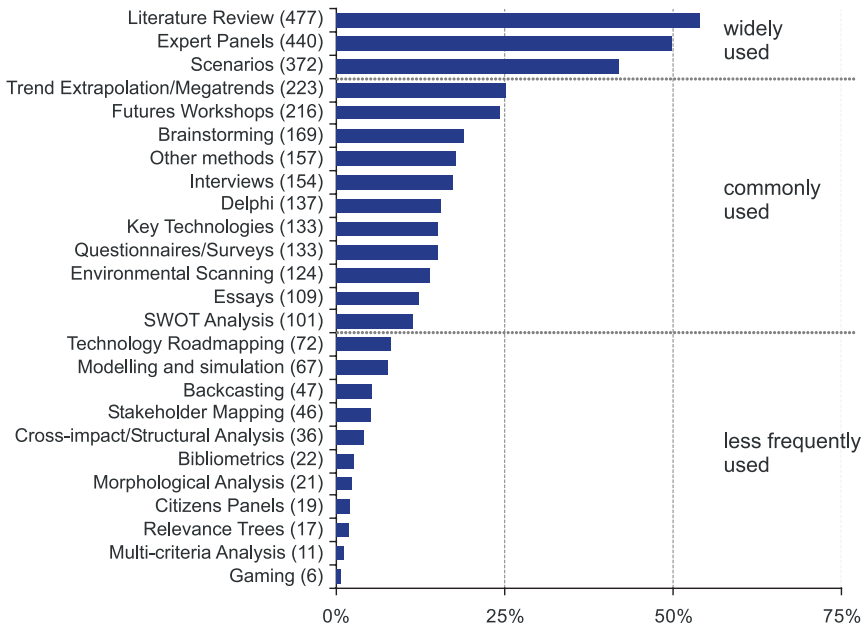
- *Expertise* refers to the skills and knowledge of individuals in a particular area or subject and is frequently used to support top-down decisions, provide advice and make recommendations. These methods rely on the tacit knowledge of people with privileged access to relevant information or with accumulated knowledge from several years of working experience on a particular domain area. Expertise often allows for a more holistic and comprehensive understanding of the theories, hypotheses and observations of a study (see also Kuusi, 1999; Scapolo and Miles, 2006).

Figure 2 The SMART Foresight Process (Popper, 2011)



experts' insights

Figure 3 Level of use of foresight methods



Note: 886 cases

Sources: EFMN and SELF-RULE (2008)

- *Interaction* recognises that expertise often gains considerably from being brought together and challenged to articulate with other expertise (and indeed with the views of non-expert stakeholders). So, given that foresight studies often take place in societies where democratic ideals are widespread, and legitimacy is normally gained through 'bottom-up' and participatory processes, it is important that they are not just reliant on evidence and expertise (see also Andersen and Jæger, 1999; Cuhls, 2003; Brummer et al., 2007).

- *Evidence* recognises that it is important to attempt to explain and/or forecast a particular phenomenon with the support of reliable documentation and means of analysis of, for example, statistics and various types of measurement indicators. These activities are particularly helpful for understanding the actual state of development of the research issue (see also Porter *et al.*, 1980; Armstrong, 2006).

The above attributes are the building blocks of the *Foresight Diamond*, which, in this paper, has been adapted to highlight the 25 methods considered in the *mapping*.[7]

Fundamental elements of foresight processes

Foresight is increasingly understood as a systematic process with five interconnected and complementary phases: *scoping; mobilising; anticipating; recommending; and transforming* (see Popper, 2011). And given that the second hypothesis of this paper relates the selection of methods to the elements and conditions influencing the *foresight process*, in this section, nine fundamental elements (used in the *mapping*) will be shortly described and presented within the *foresight process* context (see Figure 2).

- five *pre-foresight* elements (i.e. the geo-R&D context; domain coverage; territorial scale; time horizon; and the sponsorship);

- *two recruitment* elements (target groups and participation scale);

- one cross-cutting element which relates to all phases of the process but is commonly assigned to the *generation* phase (i.e. methods mix); and

- one element which results from the *generation* phase but influences both *action* and *renewal* phases (i.e. codified outputs).

The *Scoping* phase is where strategic and early process decisions are made. The strategic decisions have to do with elements related to the overall *aspirations* of an exercise (rationales, general and specific objectives, workplan, expected outcomes, etc.), while the early process decisions relate to six of the ten elements used in this paper as potential factors influencing the selection of methods. These are:

- *geo-R&D context* – A factor used to cluster countries into world regions taking into account the gross expenditure on research and development (GERD) as percentage of GDP. As mentioned in the introduction, seven *geo-R&D contexts* will be considered.

- *domain coverage* – refers to the sector, industry or research area covered by the study. This paper uses the NACE classification of industries/sectors to analyse how foresight methods have been used in the eight most commonly studied domains.

- *territorial scale* – refers to the geographical scope of a study, which can be sub-national (regional), national and supra-national (international).

- *time horizon* – refers to the selected time scale of a study. Five ranges are used in this paper: up to 10 years, 10–20 years, 20–30 years, 30–50 years and 50–100 years.

- *sponsorship* – refers to the type of actor(s) funding and supporting a study. Common sponsors of foresight include the government, non-state actors (incl. IGOs and NGOs), research actors (particularly research funding agencies) and the business sector.

The *Mobilising* phase is about enrolling key individuals and stakeholders who can contribute with their knowledge and expertise on particular issues and promote the research process within their own networks. For practical reasons it is presented as the second phase of the process but the engagement of and interaction between stakeholders is needed through the life of a study. Two fundamental elements of this phase are analysed in this paper:

- *target groups* – refer to the type of stakeholders (users/audiences/contributors) that have been involved in the study. Eight categories are considered: government agencies and departments, research community, firms, trade bodies and industrial federations, NGOs, intermediary organizations, trades unions and 'other audiences'.

- *participation scale* – refers to the level of openness of a study, but openness is not

necessarily well-captured by simply looking at the scale of participation given that its *scope* is more important; however the latter has not been captured in the *mapping*.

The *Anticipating* phase is the 'heart' of a foresight process, given that here is where prospective knowledge and shared visions are generated. It is therefore the phase in which 'codified knowledge' is fused, analysed and synthesised; 'tacit knowledge' is gathered and contrasted with codified knowledge; and (hopefully) 'new knowledge' is generated, such as shared visions and images of the future. This phase involves three interdependent activities: *exploration* – using methods like LR, *scanning* or *brainstorming* to identify and understand important issues, trends and drivers; *analysis* – using methods like *expert panels, extrapolation* or SWOT to understand how the context and main issues, trends and drivers influence one another; and *anticipation* – using methods like *scenarios* or *Delphi* to anticipate possible futures or suggest desirable ones. Two vital elements of this phase are analysed in the paper: codified outputs and the 'methods mix'. The former behaves like a 'transverse wave' which begins in the *Generation* phase and propagates through the Recommending and *Transforming* phases (see below), and possibly goes on to create a new *Scoping* phase. The latter is a cross-cutting element with its 'epicentre' in the *Anticipating* phase and waves of influence propagating into the other phases, thus shaping the ultimate outcomes of a foresight exercise. The two elements analysed in this paper are:

- *codified outputs* – refers (in this paper) to the production of policy recommendations, analysis of trends and drivers, scenarios, research and other priorities, lists of key technologies, forecasts and technology roadmaps.
- *methods mix* – refers to the combination of foresight methods. The factor itself is based on a schema introduced to examine the dynamics of methods mix: the Methods Combination Matrix (MCM). This result is used in the paper to describe the interconnections between foresight methods and to explore whether correlations between methods could explain their selections (see Figures 15 and 16).

The *Recommending* and *Transforming* phases are heavily influenced by the type, quantity, quality, relevance, usability and timely production of codified (and process-related) outputs, among others. *Action* is about reaching commitment from key players who are ready to embark on the 'business of transforming and shaping the future' through the implementation of the policies and decisions produced in the *Anticipating* phase. At this phase, the foresight process should link with traditional strategic planning processes in order to define realistic medium-to-long-term action plans. This bridge between foresight and planning is sometimes achieved with methods like *roadmapping* and *morphological analysis*, for example. *Transforming* is a mixture of intelligence and wisdom. It is about gaining knowledge and understanding of the opportunities and threats identified in the codified outputs and the process itself. This phase requires the use of evaluative approaches and, in particular, of traditional social research methods like *interviews, LR* and opinion *surveys*. [8]

SO, WHAT FACTORS INFLUENCE THE SELECTION OF FORESIGHT METHODS?

Having described the *attributes of foresight methods* and the *elements of a foresight process*, it is now time to recall the main question of the paper: *what are the factors influencing the selection for foresight methods?* The answer requires tackling eleven equally complex questions, two of which are related to the attributes of methods:

1. How is selection influenced by the *Nature of methods?*

Figure 4 Number of methods used in foresight exercises

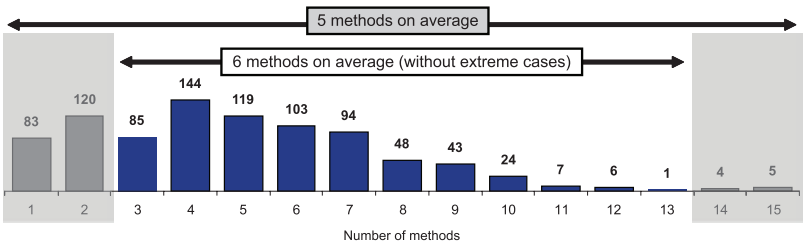
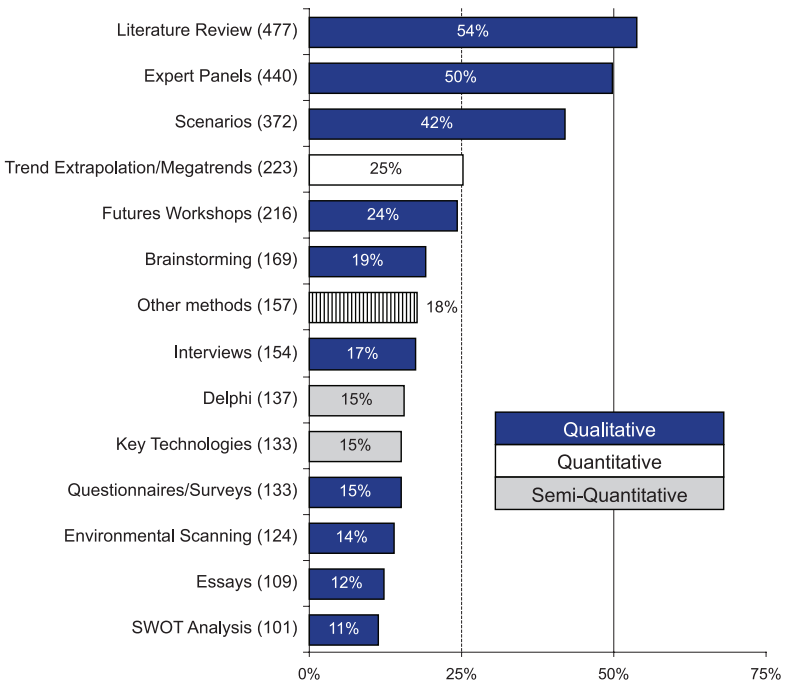


Figure 5 Nature of most commonly used foresight methods



Note: 886 cases

Sources: EFMN and SELF-RULE (2008)

experts' insights

Figure 6 Capabilities of most commonly used foresight methods

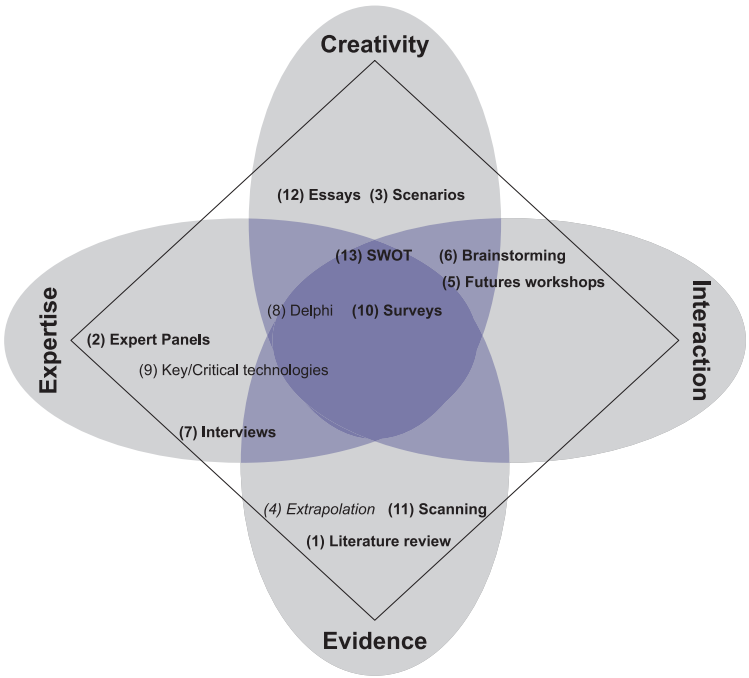


Figure 7 Methods versus geo-R&D context

Level of intensity	High R&D			Medium R&D		Low R&D	
World region	Europe	Asia	N America	Europe	Australia	Europe	S America
Cases mapped	174	30	109	299	14	110	114
Literature Review							
Expert Panels							
Scenarios							
Trend Extrapolation							
Futures Workshops							
Brainstorming							
Other methods							
Interviews							
Delphi							
Key Technologies							
Questionnaires/Surveys							
Environmental Scanning							
Essays							
SWOT Analysis							
Technology Roadmapping							
Modelling & simulation							
Backcasting							
Stakeholder Mapping							
Cross-impact/Structural A.							
Bibliometrics							
Morphological Analysis							
Citizens Panels							
Relevance Trees							
Multi-criteria Analysis							
Gaming							

Note: 850 cases

Sources: EFMN and SELF-RULE (2008)

2. How is selection inf uenced by the *Capabilities of methods?*

While the other nine are more closely related to the *elements of foresight processes*:

3. How is selection inf uenced by the *Geo-R&D context?*
4. How is selection inf uenced by the *Domain coverage?*
5. How is selection inf uenced by the *Territorial scale?*
6. How is selection inf uenced by the *Time horizon?*
7. How is selection inf uenced by the *Sponsorship?*
8. How is selection inf uenced by the *Target groups?*
9. How is selection inf uenced by the *Participation scale?*
10. How is selection inf uenced by the *Codified outputs?*
11. How is selection inf uenced by the *Methods mix?*

But before embarking upon this journey, let us first present the results of the basic frequency count data on the extent to which twenty five foresight methods are used in 886 cases. In Figure 3, the number of times each method was used is indicated in the brackets next to the method. For example, *Expert Panels* was applied 440 times. The frequency of use of methods clearly shows three blocks or groups:

- The *widely used* methods are *LR, expert panels* and *scenarios*, all of which are qualitative.
- The category of *commonly used* methods includes *extrapolation/megatrends, futures workshops, brainstorming, other methods, interviews, Delphi, questionnaire/survey, key technologies, scanning, essays and SWOT.*
- Finally, a third group of less *frequently used* methods include *roadmapping, modelling/simulation, backcasting, stakeholders mapping, structural analysis, bibliometrics, morphological analysis, citizen panels, relevance trees, multi-criteria* and *gaming.* While the data suggests that this group of methods is rarely used, some of the numbers

here are lower than might be anticipated and can probably be assigned to biases arising from the *mapping*. For example, methods such as *structural analysis* and *relevance trees* have been occasionally applied in Spain and France at the sub-national level. But because mapping at this level has been weaker than at the national level, the data does not do justice to the likely higher frequency of their applications.

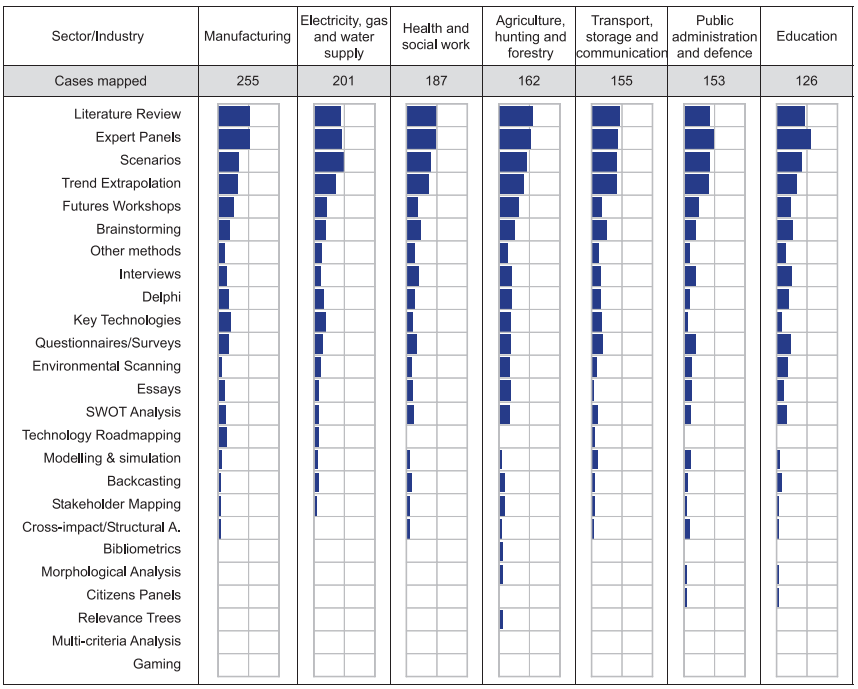
This information could raise one additional question: how many methods are used in an 'average' foresight study? Figure 4 shows that on average, five or six methods are used per initiative. However, the variation is high, so it can be concluded that the diversity of methods used is also high. But, these numbers should not be taken for granted. As we have already mentioned, foresight exercises tend to use multiple methods in their methodological designs. There are other factors considered in the remainder of this paper that need to be added to the equation. In any case, knowing the level of use of methods and the 'average' number of methods used in a project is a very good starting point for the eleven-question journey!

How is selection influenced by the 'Nature of methods'?

Figure 5 shows the nature of commonly and widely used foresight methods. The results reveal that the top 3 and a total of 10/14 methods are qualitative, thus suggesting that qualitative attributes are more 'popular' or well-liked than quantitative and semi-quantitative ones. Such popularity may be due to the fact that the study of the future is inevitably informed by opinions and judgements based on subjective and creative interpretations of the changes (or lack of changes) creating or shaping the future. And these attributes are mostly found in qualitative techniques. *Literature Review (LR)* is a fundamental research method extensively used in every discipline, therefore it does not surprise that it comes in at the top position. Indeed, despite these relatively high numbers, a foresight practitioner would believe that *LR* and other generic methods, such as open-ended surveys, are being under-reported in the database. *Delphi* and *Key Technologies* are both used in 15% of studies. They are the only semi-quantitative techniques among the most commonly used methods list. At the same time, extrapolation is the only quantitative method, perhaps because it is a very useful technique to explain how 'lack of changes' in the present may be ref ected in the future.

So, the inf uence of the *nature of methods* is *very high* and biased towards qualitative methods.

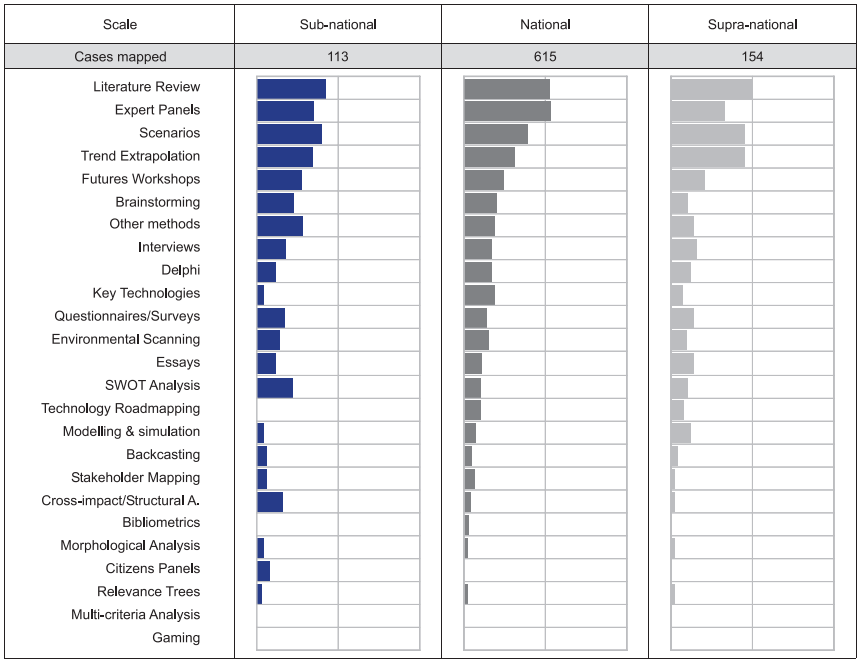
Figure 8 Methods versus domain coverage



Note: 804 cases. The mapping of domains allows for multiple selections

Sources: EFMN and SELF-RULE (2008)

Figure 9 Methods versus territorial scale



Note: 882 cases

Sources: EFMN and SELF-RULE (2008)

experts' insights

How is selection influenced by the 'Capabilities of methods'?

Figure 6 shows an impressionistic representation of the most commonly used methods inside the Foresight Diamond framework. The shading ref ects the overall ability to gather or process information based on evidence, expertise, interaction or creativity. Here it is worth noting that the interaction dimension is first 'touched' by methods like *futures workshops* and *brainstorming* (although some types of *expert panels* are designed to promote participation and interaction between groups of stakeholders). Considering that these methods are in fifth and sixth position, in terms of frequency of use, the previous assumption that an 'average' study may combine five or six methods, suggests that – even with the already mentioned *problems of inclusion* – the mapped foresight work is aligned with concepts accepted by the community of practitioners, where foresight is seen as a way to encourage more structured debate with wider participation leading to the shared understanding of long-term issues (Georghiou *et al.*, 2008). The picture shows that most projects using five or more methods tend to select them – even if by chance – in a way that the four fundamental *capabilities* of methods are met. The reader should also note that there are no commonly used methods near the top vertex of creativity. This may be a consequence of the lack of guidance on how to apply techniques such as *gaming* and other creative methods like *wild cards* or *weak signals.* [9]

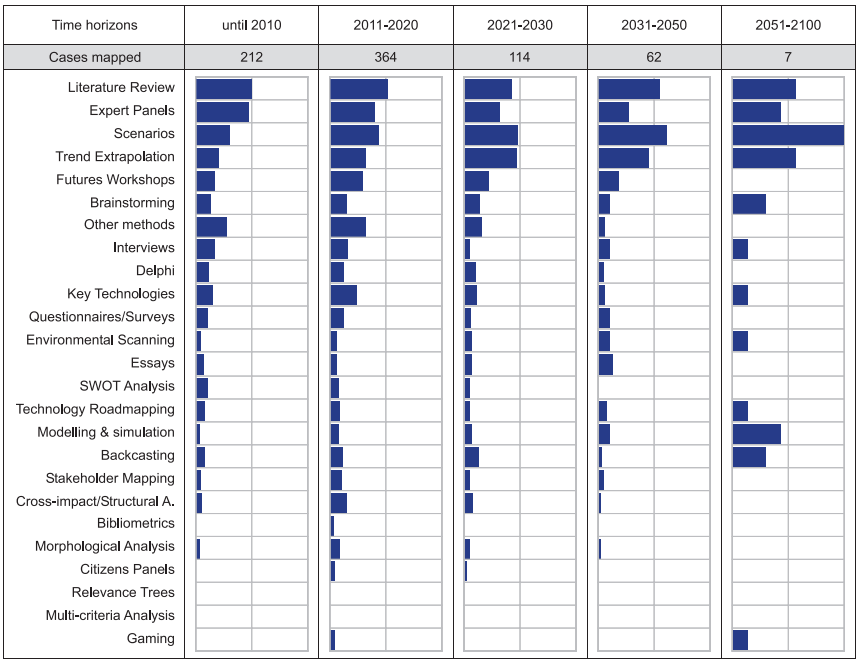
So, the inf uence of the *capabilities of methods* is *high* but not balanced. At the same time, however, it would be unrealistic to expect all foresight studies to give an equal weighting to all four vertices of the Diamond.

How is selection influenced by the 'Geo-R&D context'?

The consideration of the *geo-R&D context* (see Introduction and Section 2) as one of the factors inf uencing the selection of foresight methods has proven an interesting proposition. While the previous question was about the *capabilities of methods*, the geo-R&D context could (but not always) ref ect the capabilities to use the methods.

For example, Figure 7 shows that methods that rely on the availability of knowledge about emerging/cutting-edge technologies are more often used in high-R&D intensity countries. Such is the case for *roadmapping* (commonly used in North America) and *modelling* (well-liked in high-R&D Asia). Here the reader may wonder why *Delphi* usage does not behave according to the implicit hypothesis. A possible explanation is that, nowadays, Delphi

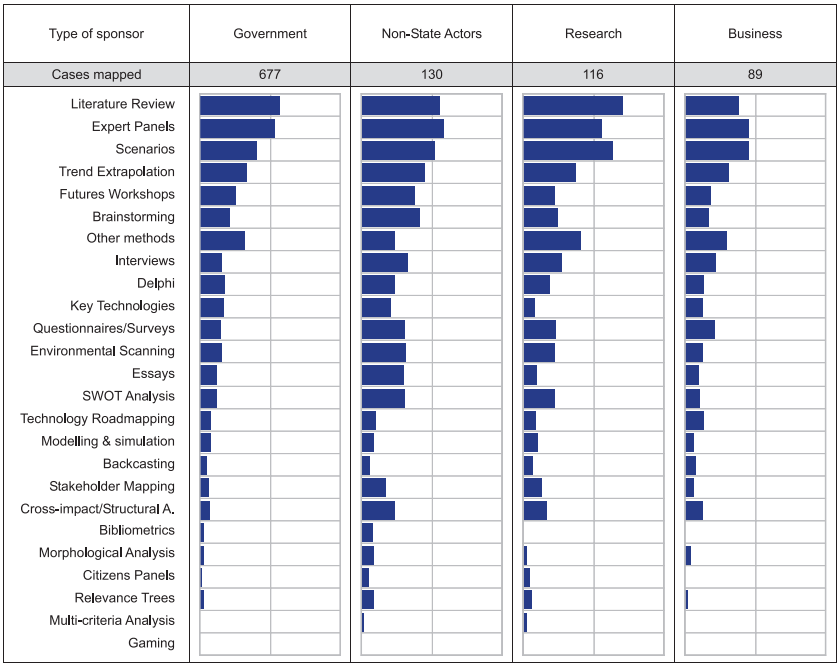
Figure 10 Methods versus time horizon



Note: 759 cases

Sources: EFMN and SELF-RULE (2008)

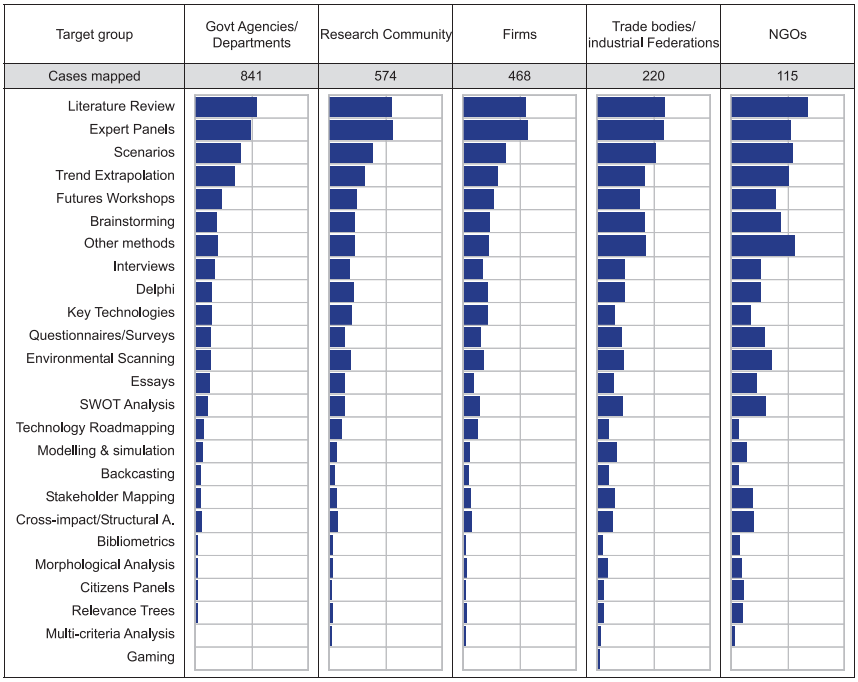
Figure 11 Methods versus sponsorship



Note: 793 cases. The mapping of sponsorship allows for multiple selections

Sources: EFMN and SELF-RULE (2008)

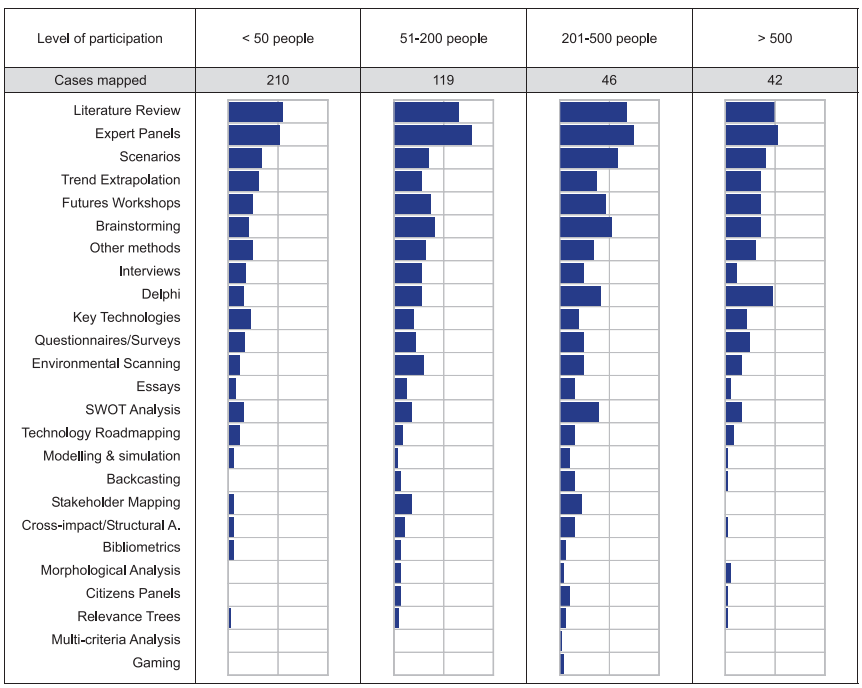
Figure 12 Methods versus target groups



Notes: 886 cases. The mapping of target groups allows for multiple selections

Sources: EFMN and SELF-RULE (2008)

Figure 13 Methods versus participation scale



Note: 417 cases

Sources: EFMN and SELF-RULE (2008)

is much more widely used as a tool to explore how technologies may interact or shape possible application environments in the future (e.g. R&D infrastructures or socio-economic sectors), as opposed to the traditional technological orientation that the method had during the second half of the 20th Century (see Popper and Miles, 2005).

Countries with lower-R&D intensities tend to use exploratory and comparative techniques, e.g. *scanning*, *SWOT*, *bibliometrics* and *other methods*, such as benchmarking and patent analysis which were included in the South American SELF-RULE *mapping instrument*. [10]

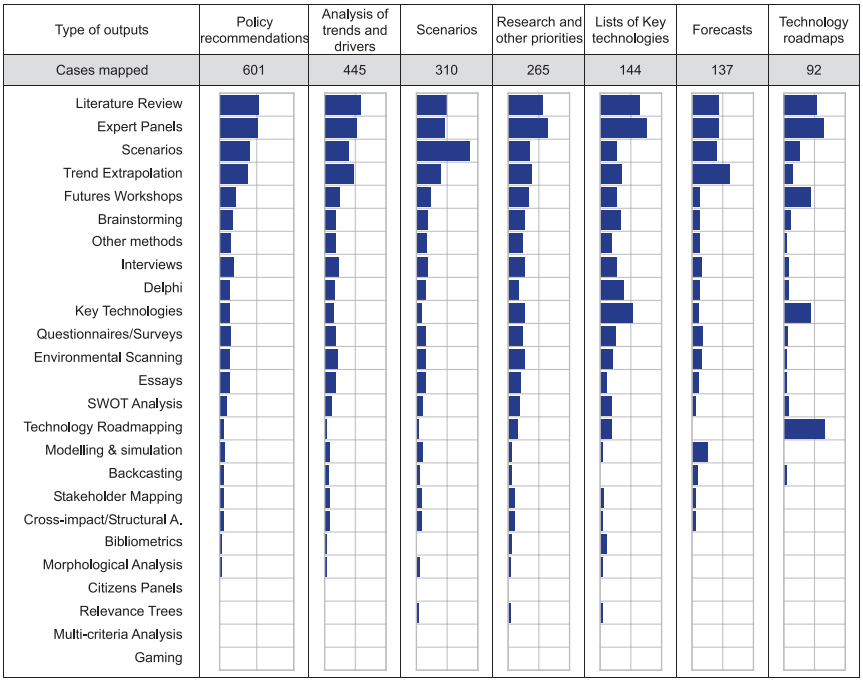
The results also show that the R&D context has little inf uence in the selection of the top three methods in Europe, but it does have a stronger inf uence in further selections. For instance, in lower-R&D Europe *brainstorming*, *Delphi* and *key technologies* are in much higher positions (fourth, fifth and sixth, respectively).

Other remarkable findings include:

- lower use of LR in high R&D Asia and Australia;
- lower use of *scenarios* in North America (but note the higher use of futures workshops);
- rather high use of *brainstorming*, *interviews* and *modelling* in Asia;
- very high use of *other methods* in South America (evidence of the use of mixed approaches, e.g. productive chains, competitive intelligence, and the tools of la *prospective*, such as MICMAC/MACTOR/SMIC);
- *Delphi* being used mainly in Asia, low-R&D Europe and South America, and not present in over 100 cases mapped from North America;
- predominantly high use of *scanning* and *essays* in South America;
- high use of SWOT in low-R&D Europe;
- *backcasting* being practiced mainly in Asia and Australia; and
- methods like *structural analysis*, *stakeholders mapping* and *relevance trees* more likely to be used in South America; this ref ects a latent methodological lock-in caused by early practitioners in the region.

experts' insights

Figure 14 Methods versus target groups



Notes: 802 cases. The mapping of outputs allows for multiple selections

Sources: EFMN and SELF-RULE (2008)

In addition, the size of the bars in Figure 7 show that low R&D intensity countries include more methods in the methods mix.

In summary, the influence of the *geo-R&D context* would seem to be rather *high*. However, the reader should be careful in making assumptions or generalisations based on Figure 7, given that, for example, the apparent high use of key technologies in lower-R&D Europe is pretty much a result of applications of the method in one particular country, i.e. Spain.

How is selection influenced by the 'Domain coverage'?

Figure 8 shows the use of methods in the seven 'best-mapped' sectors/industries from a list of seventeen categories used in the EC's NACE classification. These are: manufacturing; electricity, gas and water supply; health and social work; agriculture, hunting and forestry; transport, storage and communication; public administration and defence; and education. The results show an even and fairly proportional use of all methods across the seven *domains*. The reason for the agriculture bars looking slightly bigger than other sectors' has to do with the high number of South American cases in this domain, where more methods tend to be included in the methods mix. Even so, two comments can be made about the charts: the first is that *roadmapping* seems to be more commonly used in manufacturing; electricity, gas and water supply (and the energy sectors in general); and transport, storage and communication. The second is that less frequently used methods tend to be applied to domains such as agriculture, public administration and education.

Therefore, the influence of the domain coverage is relatively low.

How is selection influenced by the 'Territorial scale'?

Even among foresight practitioners it has been often believed that methods used in sub-national or regional exercises are different from those applied at the national and supra-national levels. Nonetheless, Figure 9 reveals that such a difference is not very big.

One can argue that there are role-related and technical constraints, which could make the use of a particular method unattractive. For instance, sub-national studies rarely have the power to enact big S&T programmes, which is more of a 'territory' or role of national governments – and the European Commission at the European Union level. For this reason, *roadmapping*, *key technologies* and *modelling* are less likely to be carried out at this level. As for the technical limitations, lower figures in the use of *brainstorming* and *SWOT* at the supra-national level reflect the current practical difficulties of organising large-scale meetings with experts from different countries, although advancements in ICTs could change this in the future. However, methods like *citizen panels*, *SWOT*, and *cross-impact* are more practiced at this level.

The above suggests that the influence of the *territorial scale* on selection is at best moderate.

How is selection influenced by the 'Time horizon'?

With the exception of *expert panels* and *scenarios* where the use increases as the time horizon gets longer, Figure 10 shows no clear patterns explaining the relationship of methods vis-à-vis the time horizon. This may be a consequence of the lack of relevant literature and discussion *fora* on the pros and cons of foresight methods with regards to their effectiveness and capabilities to navigate into near, far or even far-off futures. In fact, the most interesting results, even if poorly represented, emerge from exercises with very large time horizons (50 to 100 years) where scenarios were always used, and combined with *extrapolation, modelling/simulation, backcasting, brainstorming, roadmapping* or *gaming*. Other findings include:

- decreasing use of *Delphi* as the time horizon gets longer;
- increasing use of *scanning* as the time horizon gets longer; and,
- absence of *SWOT* and *bibliometrics* in studies looking into the far future.

But even given the already mentioned information deficit on the challenges that different time horizons pose to a study, the results still show a *moderate* influence of the chosen time horizon on the selection of methods.

How is selection influenced by 'Sponsorship'?

Figure 11 presents the use of methods in studies sponsored by the government, non-state actors, research actors and businesses. The main finding here is that studies sponsored by non-state actors (i.e.

NGOs as well as IGOs, like the EC and UNIDO) are more demanding in scope. This is confirmed with the average number of methods used in projects sponsored by the different actors:

- *Government* *(4 methods)*
- *Non-state actors* *(6 methods)*
- *Research* *(5 methods)*
- *Businesses* *(4 methods)*

Of course, these numbers provide only a rough indication given that the mapping of sponsorship allows for multiple selections. Other interesting patterns include: high use of *LR* mainly in studies sponsored by research, government and non-state actors. One possible explanation for the lower use of *LR* in businesses is that information for decision making is often needed in pre-packaged and digestible formats thus making *LR unattractive*. Finally, the absence of bibliometrics in projects sponsored by research actors is somewhat unexpected. Therefore, the *sponsorship* inf uence is somewhat *moderate*.

How is selection influenced by the 'Target groups'?

Figure 12 shows how methods relate to the target groups of studies. The similarity in patterns for all stakeholders is not a very surprising result, mainly because one of the most common methodological pieces of advice often given to sponsors and organisers is that, regardless of the methods chosen, if the study aims to have an impact on a given science, technology and innovation system, the overall project should target key stakeholders more or less equally. Therefore, one could conclude that potential exclusions of stakeholders in a study are not a matter of methodology but a matter of strategy – or lack of it.

Another result is that networking organisations (e.g. trade bodies and NGOs) have been mainly targeted in projects that have been methodologically demanding, which explains the slightly but consistently bigger size of the bars.

Overall, the inf uence of the *target groups* is rather *low*.

How is selection influenced by the 'Participation scale'?

In foresight, the level of participation is expected to go beyond what is normally achievable in more regular agenda-setting *fora*; however, Figure 13 shows that 210 cases have involved less than 50 people. This could be a measurement effect, given the already mentioned problems of inclusion; or it could be evidence of the different understandings of what foresight really is – a process combining participatory, prospective and policy-making approaches (see also Gavigan et al., 2001).[11] Other findings include:

- relatively higher use of *expert panels*, scanning and *stakeholder analysis* in cases involving between 50 and 500 people;
- much higher use of *scenarios, brainstorming* and *SWOT* in projects with participation levels above 200 people;
- relatively lower use of *interviews* in projects in very large scale projects; and
- a considerable larger use of Delphi in highly participatory studies.

On the whole, the inf uence of the *participation scale* is somewhat *moderate*.

Figure 15 Methods mix – or methods combination matrix (MCM)

Ranking by frequency of use	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Methods Combination Matrix (MCM)	**Literature Review**	**Expert Panels**	**Scenarios**	*Trend extrapolation/Megatrends*	**Futures Workshops**	**Brainstorming**	Other methods	**Interviews**	Delphi	Key Technologies	**Questionnaires/Surveys**	**Environmental Scanning**	**Essays**	**SWOT Analysis**	Technology Roadmapping	*Modelling and simulation*	**Backcasting**	Stakeholder Mapping	Cross-impact/Structural Analysis	*Bibliometrics*	**Morphological Analysis**	**Citizens Panels**	**Relevance Trees**	Multi-criteria Analysis	**Gaming**
1 **Literature Review**	477	H	H	H	M	M	M	M		M															
2 **Expert Panels**	VH	440	M	M	M	M		M	M	M															
3 **Scenarios**	H	H	372	H	M	M	M																		
4 *Trend Extrapolation/Megatrends*	VH	VH	VH	223	M	M	M	M		M	M	M	M			M									
5 **Futures Workshops**	VH	VH	H	M	216	M	M			M															
6 **Brainstorming**	VH	VH	H	M	H	169	H	M	M	M	M	M		M											
7 Other methods	VH	H	H	M	H	H	157	M	M	M	M	M		M											
8 **Interviews**	VH	VH	H	H	M	M	M	154			H	M		M											
9 Delphi	VH	VH	M	M	M	H	M		137	M	M	M													
10 Key Technologies	VH	VH	M	H	M	M	M	M	M	133		M		M	M										
11 **Questionnaires/Surveys**	H	VH	H	H	M	M	M	H	M		133	M		M											
12 **Environmental Scanning**	VH	VH	H	H	M	H	VH	M	M	M	M	124	M	M				M							
13 **Essays**	H	H	H	H	M	M	M	M				M	109												
14 **SWOT Analysis**	VH	H	H	M	H	H	VH	M	M	M	M	M		101				M	M						
15 Technology Roadmapping	VH	VH	M	M	H					H					72										
16 *Modelling and simulation*	H	M	VH	VH												67									
17 **Backcasting**	H	H	H	H	M	M		M				M				M	47								
18 Stakeholder Mapping	VH	VH	H	VH	H	VH	VH	H		M	M	VH	M	H				46	M	M	M		M		
19 Cross-impact/Structural Analysis	VH	VH	VH	VH	M	VH	VH	VH	M		VH	VH	M	VH				M	36		M				
20 *Bibliometrics*	VH	H	M	VH	M	H	VH	VH		VH	H	VH	H	H				H		22	M		M		
21 **Morphological Analysis**	VH	VH	VH	H	H	VH	VH	VH	M	M	H	H	VH	M			M	H	H	M	21		H		
22 **Citizens Panels**	H	VH	H	M	VH	H	VH	H	M		M	H	M	H				M	M			19			
23 **Relevance Trees**	VH	VH	VH	VH	VH	VH	VH	VH	M	M	H	VH	VH	VH				VH	M	M	H		17		
24 Multi-criteria Analysis	VH	M		VH	M	M	M	M		M	M	M	M			H								11	
25 **Gaming**	VH	VH	VH	VH	VH	VH			M			H				H	M	VH	M						6

Key: Low (blank); moderate (M); high (H); very high (VH); **bold** = qualitative; *italic* = quantitative; normal = semi-quantitative

Note: 886 cases

Sources: EFMN and SELF-RULE (2008)

How is selection influenced by expected 'Codified outputs'?

For cases with common outputs like policy recommendations and analysis of trends and drivers, Figure 14 shows no significant differences in the selection of methods, other than extrapolation being more used for the latter. A similar pattern is found in cases producing scenarios but with much higher – and obvious! – use of *scenarios*. In the 265 cases identifying research and other priorities, there is a higher use of *LR* and *expert panels*. Interestingly, cases which produce lists of key technologies and roadmaps do not necessarily apply techniques known by these names. This of course could be interpreted as a f aw in the mapping, however, experienced practitioners would know – and the results also show – that lists of key technologies can also be produced with expert panels, *LR, Delphi, extrapolation, brainstorming* and *interviews*. For instance, the EUFORIA project[12] (see Loveridge et al., 2004) used *Delphi* in an exploratory way

experts' insights

to produce a 'success scenario' (Miles, 2005) for the European Knowledge Society by 2015. Similarly, *technology roadmaps* can result from the amalgamation of work using *expert panels, LR, futures workshops* and *key technologies*. Finally, *extrapolation* and *modelling* are more commonly used to produce forecasts and scenarios (see also Fontela, 2000); and *bibliometrics* seems to be mainly used to inform recommendations, analysis of trends and drivers, research priorities and lists of key technologies. Thus, overall, the influence of expected *codified outputs* on methods choice is moderately *high*.

How is selection influenced by the 'Methods Mix'?

To understand the relationships and influence of methods among themselves – the so-called 'methods mix' – it was necessary to create a methods combination matrix (MCM). This involved crossing the variable methods against itself (originally producing a symmetric matrix) and dividing each row by the respective value in the diagonal which indicates the total number of times a method was used in a sample of 886 cases. The outcome of this operation shows in each cell the proportion in which two methods are combined with respect to the number of times the method on the row was used. Nevertheless, to present results in a more 'digestible' way, the following categories have replaced the percentages: "blank" for *low* combinations (i.e. figures below 19%); "M" for *moderate* combinations (i.e. 20-39%); "H" for *high* combinations (i.e. 40-59%); and "VH" for *very high* combinations (i.e. figures above 60%). Likewise, instead of having "VH" or 100% in all cells of the diagonal, the total frequency of use have been included to remind the reader that the levels of combinations are relative to these number of cases (See Figure 15).

Let us now move into the various analyses and interpretations of the MCM. To begin with, the reader should notice that the arrangement of methods is based on their frequency of use (i.e. in the same order as Figure 3 above). This ranking is displayed on the top row and left-hand side column of the matrix.

As Figure 15 has a significant amount of information, only a few findings will be highlighted here:

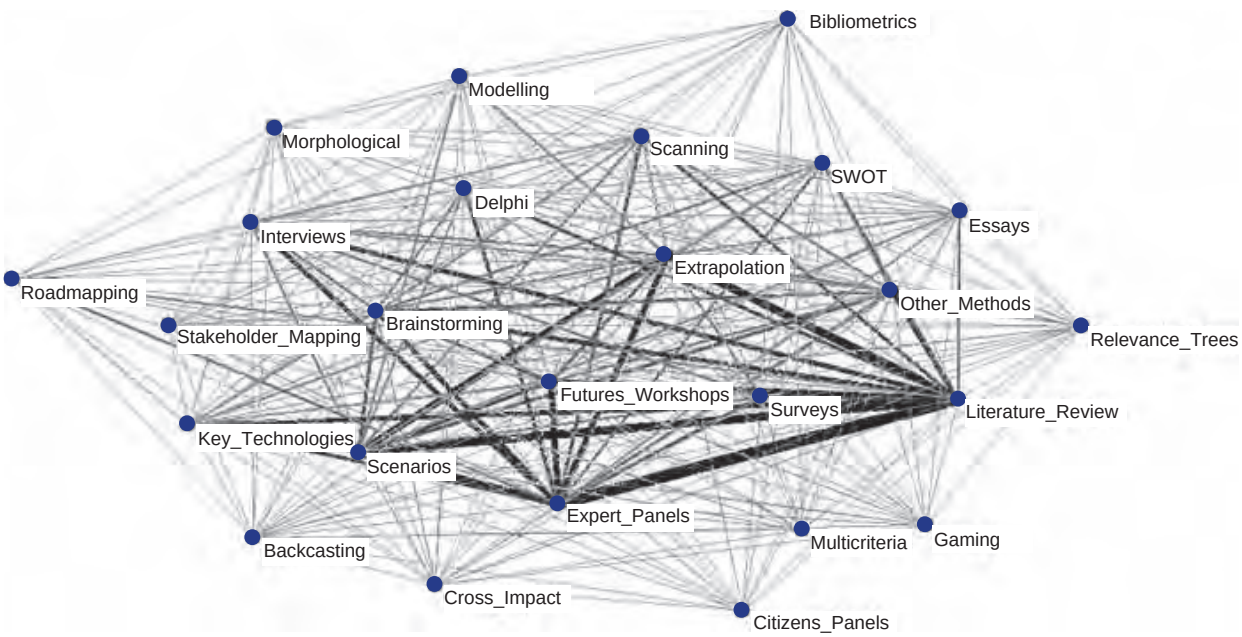
- as expected, most methods are highly combined with *LR, expert panels* and *scenarios*. So, in order to avoid repetitions these methods are not mentioned in subsequent highlights – but the reader is advised to keep this in mind!
- *scenarios* are also highly used with trends/ *megatrends extrapolation* and moderately used with 3 other methods;
- *brainstorming* is highly used with *futures workshops* and moderately used with 7 other methods;
- *Delphi* is highly used with *brainstorming* and moderately used with 7 other methods;
- *key technologies* is highly used with *extrapolation* and moderately used with 9 other methods;
- *environmental scanning* is highly used with *extrapolation* and *brainstorming* while used moderately with 8 other methods; and,
- *SWOT* is highly used with *futures workshops* and *brainstorming* whereas moderately used with 8 other methods; for example.

The MCM also shows that some less-frequently used methods that require a deeper understanding of the context of a study – such as *stakeholder mapping, relevance trees* and *cross-impact analysis* – often use many other methods (probably) to gather relevant and up-to-date information.

More in-depth analysis of the MCM could, without doubt, lead to many other conclusions. Unfortunately, given the space limitation, this paper will not speculate or provide explanations about the patterns shown in each of the 600 cells representing the combination space of the 25 methods used in the *mapping*.

Instead, the results of a more thought-provoking analysis carried out using 3-dimensional mapping tools to visualise the *methods mix* is presented in Figure 16. The 3D map is a powerful representation of the number and type of linkages between methods. Using different line widths and grey scales to weight relationships, it clearly shows the strength of methods combinations. For instance, the line between *expert panels* and *literature review* is not only the widest but the darkest one too, meaning that the two methods are very highly (VH) combined. Another fascinating result of this analysis is the elucidation of a sort of family of 'Methodological

Figure 16 Using 3D mapping tools to visualise the "methods mix"



Pyramids' (frameworks), of which the basic and most noticeable structure has *LR*, *expert panels*, *scenarios*, and *extrapolation* of trends and megatrends at its vertices. Of course, the use of additional or different methods would lead to different methodological 'shapes' – a potential topic for future research. Other visualisation tools and conceptual frameworks such as the Foresight Diamond could also contribute to a better understanding of the rich but complex information included in the MCM. A targeted example of this is presented in Figure 17, which translates the MCM results for one method – *technology roadmapping* – into a more comprehensible and logical map of relationships. Based on the above, we can, without doubt, conclude that the inf uence of the *methods mix* is very high.

FINAL REMARKS

The findings in Section 3 have collectively confirmed the two hypotheses of this paper: *foresight methods are selected in a (not always coherent* or *systematic) multi-factor process*. So far this process has been dominated by the intuition, insight, impulsiveness and – sometimes – inexperience or irresponsibility of practitioners and organisers. When Slaughter (2004) suggests that "it is the depth within the practitioner that evokes depth and capacity in whatever method is being used", practitioners should also bear in mind that part of this "depth" requires the acknowledgement of foresight as a process (Popper, 2008) together with the recognition of the fundamental attributes of methods. In this paper the inf uence of eleven factors on the selection of foresight methods have been described and objectively analysed in order to avoid – or at least reduce – the typical prescriptive tone of most available literature on the subject. But given the amount of information presented in previous sections, these concluding remarks will only provide a 'snapshot' of the main findings (see Figure 18):

- The factors most inf uential in the selection of methods are their *nature* and the *methods mix*. The former shows that qualitative approaches are definitely favoured while the latter shows that some methods go practically hand-in-hand, such as the apparent use of *brainstorming* as an input for *Delphi*.
- Three factors show a relatively high inf uence: the *capabilities of methods* – showing a bias towards methods gathering and processing information based on expertise and evidence; the *geo-R&D context*, showing, for example, that foresight methodologies in lower-R&D contexts tend to be more demanding in terms of number of methods; and the *codified outputs*, given that some common outputs are largely derived from the use of particular methods (e.g. scenarios, roadmaps and lists of key technologies).
- Four factors show a more moderate inf uence: *territorial scale*, where role-related and technical constraints tend to better explain some selections; time horizon, showing, for example, that the use of methods could increase or decrease when the *time horizon* gets longer; *participation scale*, revealing that some resource-intensive and participatory approaches (e.g. Delphi) are not very much of a choice in projects with participation levels below 50 people. However, low participation in a study could also be because these methods were not used; and the type of sponsorship, showing, for instance, that studies sponsored by non-state actors are more demanding in scope.
- Finally, factors like the *domain coverage* and the *target groups* tend to have low inf uence on the selection of methods.

Overall the findings have revealed that foresight practices are under-exploiting existing methods based on creativity and interaction. For this reason, the paper would like to conclude with an open invitation to futurists and foresight practitioners to contribute to the development of a more innovative research agenda on the future of foresight methods themselves (Miles et al., 2008) and the balanced promotion of more prospective and participative techniques. Furthermore, future-proof foresight and horizon scanning initiatives must consider the inclusion of "out-of-the-box" thinking leading to the identification and systematic analysis of both surprising and emerging issues (e.g. wild cards and weak signals).

Figure 17 Using the Foresight Diamond to visualise the "roadmapping mix"

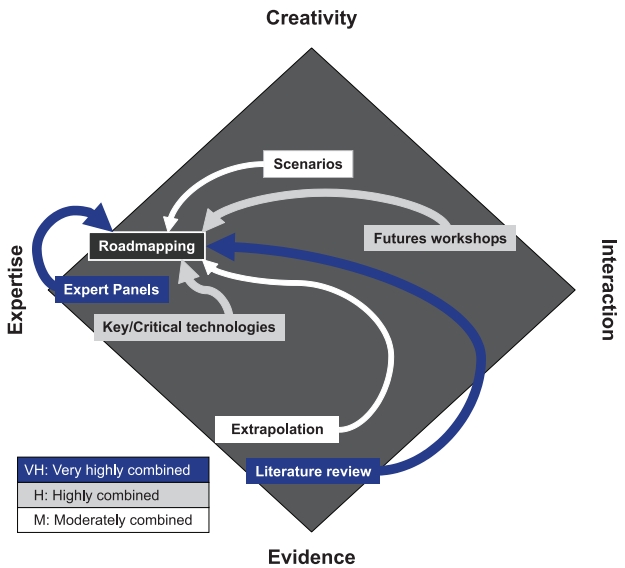


Figure 18 Factors influencing the selection of foresight methods

Attributes of foresight methods		Influence on methods selection			
		Low	Moderate	High	V-High
Intrinsic nature (i.e. qualitative, quantitative or semi-quantitative)					••••
Capability to gather and process evidence, expertise, creativity or interaction				•••	
Elements of a foresight process		**Influence on methods selection**			
		Low	Moderate	High	V-High
Pre-Foresight phase	Geo-R&D context			•••	
	Domain coverage	•			
	Territorial scale		••		
	Time horizon		••		
	Sponsorship		••		
Recruitment phase	Target groups	•			
	Participation scale		••		
Generation, Action and Renewal phases	Codified outputs			•••	
	Methods Mix				••••

experts' insights

Annexe Short description of selected foresight methods

Backcasting – involves working back from an imagined future, to establish what path might take us there from the present.
Brainstorming – a creative and interactive method used in face-to-face and online group working sessions to generate new ideas around a specific area of interest.
Citizens Panels – a method that brings together groups of citizens (members of a polity and/or residents of a particular geographic area) dedicated to providing views on relevant issues, often for a regional or national government).
Environmental Scanning – a method that involves observation, examination, monitoring and systematic description of the social, technological, economic, environmental, political and ethical contexts of a country, industry, organisation, etc.
Essays – a method focused on one or a small set of images of the future, with a detailed description of some major trends promoting the evolution of a particular scenario, and/or of stakeholders' roles in helping to bring these about).
Expert Panels – a method that brings together groups of people dedicated to analysing and combining their knowledge concerning a given area of interest. They can be local, regional, national or international.
Futures Workshops – a method that involves the organisation of events or meetings lasting from a few hours to a few days, in which there is typically a mix of talks, presentations, and discussions and debates on a particular subject.
Gaming – one of the oldest forecasting and planning techniques, in that war gaming has long been used by military strategists. It is a form of role-playing in which an extensive 'script' outlines the context of action and the actors involved.
Interviews – often described as 'structured conversations' and are a fundamental tool of social research. In foresight they are often used as formal consultation instruments, intended to gather knowledge that is distributed across the range of interviewees.
Literature Review – often part of environmental scanning processes. Reviews generally use a discursive writing style and are structured around themes and related theories. Occasionally the review may seek to explicate the views and future visions of different authors.
Morphological Analysis – a method used to map promising solutions to a given problem and to determine possible futures accordingly. It is generally used to suggest new products or developments and to build multi-dimensional scenarios.
Questionnaires/Surveys – a fundamental tool of social research and a commonly used method in foresight.
Relevance Trees – a method in which the topic of research is approached in a hierarchical way. It normally begins with a general description of the subject, and continues with a disaggregated exploration of its different components and elements, examining particularly the interdependencies between them.
Scenarios – a method that involves the construction and use of more or less systematic and internally consistent visions of plausible future states of affairs.
SWOT Analysis – a method which first identifies factors internal to the organisation or geopolitical unit in question and classifies them in terms of Strengths and Weaknesses. It similarly examines and classifies external factors (broader socio-economic and environmental changes, for example, or the behaviour of competitors, neighbouring regions, etc.) and presents them in terms of Opportunities and Threats.
Cross-Impact/Structural Analysis – a method that works systematically through the relations between a set of variables, rather than examining each one as if it is relatively independent of the others. Usually, expert judgement is used to examine the influence of each variable within a given system, in terms of the reciprocal influences of each variable on each other – thus a matrix is produced whose cells represent the effect of each variable on the others.
Delphi – a method that involves repeated polling of the same individuals, feeding back (occasionally) anonymised responses from earlier rounds of polling, with the idea that this will allow for better judgements to be made without undue influence from forceful or high-status advocates.
Key Technologies – a method that involves the elaboration of a list of key technologies for a specific industry, country or region. A technology is said to be "key" if it contributes to wealth creation or if it helps to increase quality of life of citizens; is critical to corporate competitiveness; or is an underpinning technology that influences many other technologies.
Multi-criteria Analysis – a method used as prioritisation and decision-support technique especially in complex situations and problems, where there are multiple criteria in which to weigh up the effect of a particular intervention.
Stakeholder Mapping – a traditional strategic planning technique which takes into account the interests and strengths of different stakeholders, in order to identify key objectives in a system and recognise potential alliances, conflicts and strategies. This method is more commonly used in business and political affairs.
Technology Roadmapping – a method which outlines the future of a field of technology, generating a timeline for development of various interrelated technologies and (often) including factors like regulatory and market structures.
Bibliometrics – a method based on quantitative and statistical analysis of publications. This may involve simply charting the number of publications emerging in an area, perhaps focusing on the outputs from different countries in different fields and how they are evolving over time.
Modelling and simulation – a method that refers to the use of computer-based models that relate together the values achieved by particular variables. Simple models may be based on statistical relations between two or three variables only. More complex models may use hundreds, thousands, or even more variables (e.g. econometric models used in economic policy-making).
Trend Extrapolation/Megatrend Analysis – among the longest-established tools of forecasting. They provide a rough idea of how past and present developments may look like in the future – assuming, to some extent, that the future is a continuation of the past.

Notes:

1. The European Foresight Platform (EFP) builds on the work carried out by the European Foresight Monitoring Network (EFMN).

2. See Popper, R. (2009), Mapping Foresight: Revealing how Europe and other world regions navigate into the future, EFMN, Luxembourg: Publications Office of the European Union, European Commission, 126pp. Available at: http://ec.europa.eu/research/social-sciences/pdf/efmn-mapping-foresight_en.pdf

3. SELF-RULE (Strategic Euro-Latin Foresight Research and University Learning Exchange) is an academic Network financed by the European Commission's ALFA Programme under the Cooperation for the Scientific and Technical Training Programme (see Popper and Villarroel, 2006; Villarroel et al., 2007). The network, together with 4-SIGHT-GROUP, launched a mapping initiative in Spanish which initially focused on Latin American foresight and is now being expanded to a more global perspective. The mapping instrument is open to the public and can be accessed at http://www.4-sight-group.org/mapping.

4. The databases have been shaped by previous work carried out by the EUROFORE Pilot Project – a collaborative pilot project between leading foresight institutes in Europe in the European Science and Technology Observatory (ESTO) network (see Keenan et al., 2003).

5. The 2005 Gross Expenditure in Research and Development (GERD) for Europe: (in alphabetical order) Austria (2.43%), Belgium (1.82%), Bulgaria (0.5%), Cyprus (0.4%), Czech Republic (1.42%), Denmark (2.44%), Estonia (0.94%), Finland (3.43%), France (2.13%), Germany (2.51%), Greece (0.61%), Hungary (0.94%), Iceland (2.83%), Ireland (1.25%), Israel (4.71%), Italy (1.1%), Latvia (0.57%), Lithuania (0.76%), Luxembourg (1.56%), Malta (0.6%), Netherlands (1.78%), Norway (1.51%), Poland (0.57%), Portugal (0.8%), Romania (0.39%), Slovakia (0.51%), Slovenia (1.22%), Spain (1.12%), Sweden (3.86%), Switzerland (2.93%), Turkey (0.67%), and United Kingdom (1.73%).

6. Keenan and Popper (2007) have recently produced a practical guide which further discusses these features around four hypothetical processes integrating foresight in research infrastructures policy formulation. See http://prest.mbs.ac.uk/foresight/rif_guide.pdf.

7. The data for Latin America is based upon a mapping instrument that includes 33 methods. Some additional methods include: benchmarking; genius forecasting; time series analysis; patent analysis; polling/voting; role playing; science fictioning; wild cards and weak signals mapping.

8. For further information on foresight evaluation, see Georghiou and Keenan (2005) and Popper, R. et al (2010), Evaluating Foresight, available at: http://rafaelpopper.wordpress.com/evaluating-foresight/ or visit http://www.evaluatingforesight.com.

9. Wild Cards are situations/events with perceived low probability of occurrence but potentially high impact if they were to occur. Weak Signals are unclear observables warning us about the probability of future events (including Wild Cards). They implore us to consider alternative interpretations of an issue's evolution to gauge its potential impact. Perhaps the largest available database of wild cards and weak signals can be found at http://www.iknowfutures.eu. iKnow is a blue sky research and horizon scanning initiative launched by the European Commission and led by the University of Manchester with the participation of seven other partners (FFRC, Z_punkt, TC AS, RTC, ICTAF, Cyber Fox and Mindcom).

10. This reflects the recent penetration of technology watch tools in the region (see Popper and Medina, 2008).

11. For a discussion about the role of participation and bottom-up approaches in foresight within European coordination tools for 'Open Method of Coordination' (such as ERA-NETs) see Brummer et al., 2007.

12. See (no longer maintained) EUFORIA project website at http://prest.mbs.ac.uk/euforia.

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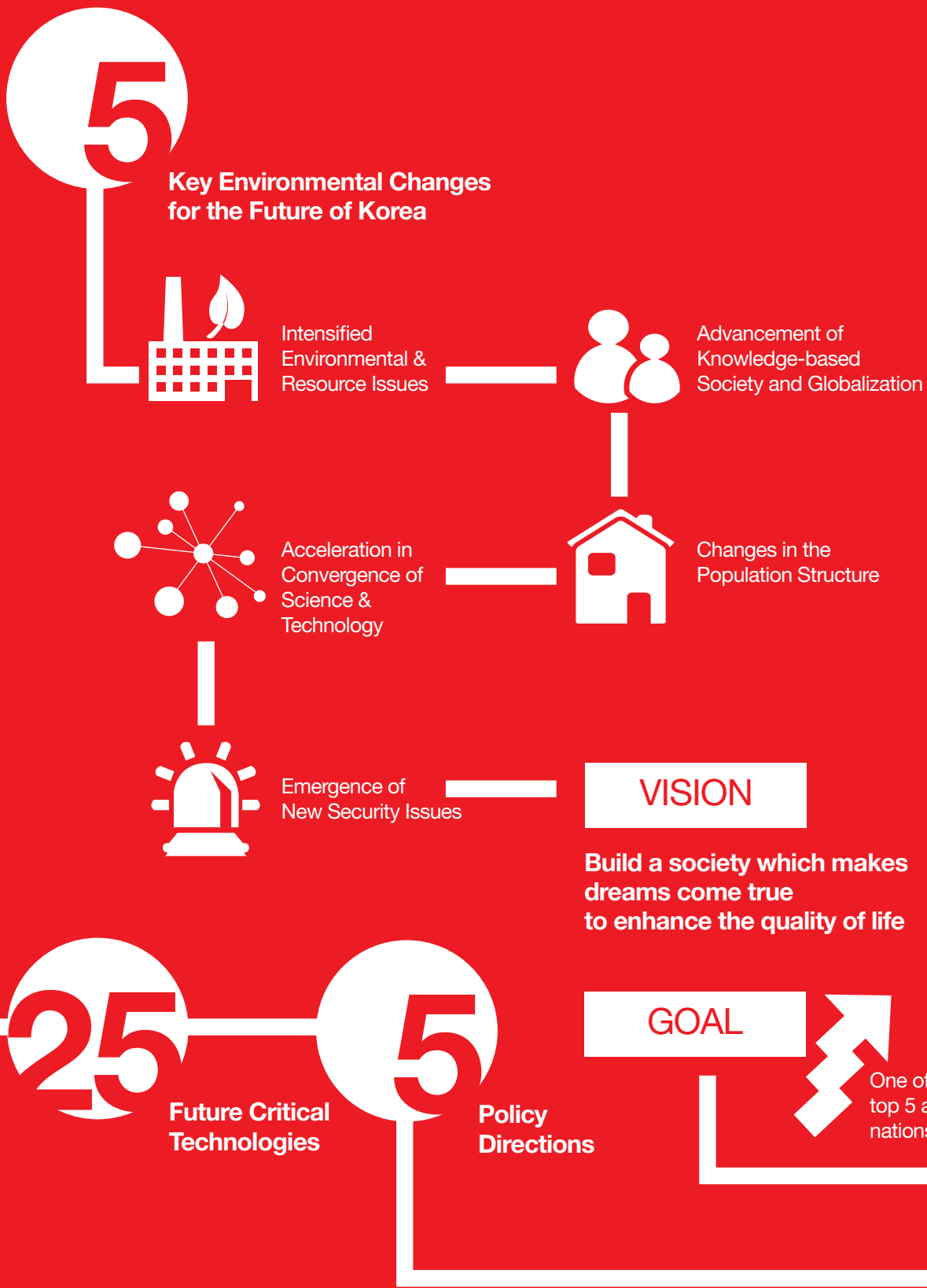
Youth Engagement

MIGHT supports initiatives by the youth movement

The engagement of the youth via myForesight™ initiative is important to examine their thoughts and expectations as they are tomorrow's leaders, workforces and entrepreneurs of the country. In line with this, MIGHT in collaboration with myHarapan is organising gatherings to Universities throughout Malaysia to get the youth's inputs on the current ETP and GTP program and how we can leverage on it for the betterment of the future development. Don't miss out this opportunity to share with us your views. Stay alert for more interesting activities prior to the gatherings. Gathering dates will be announced soon.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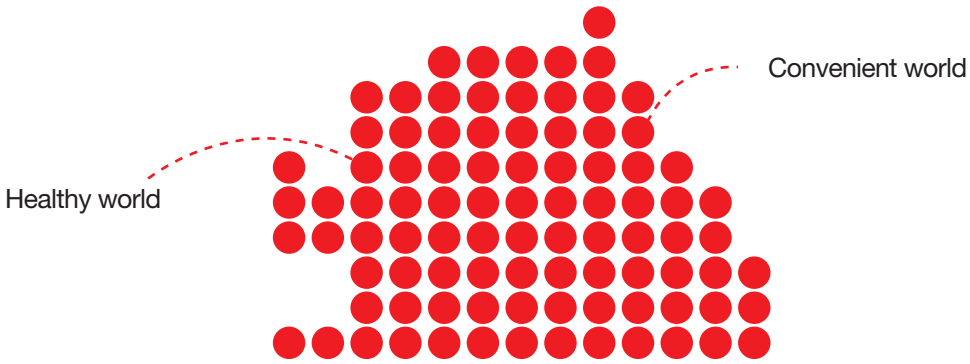
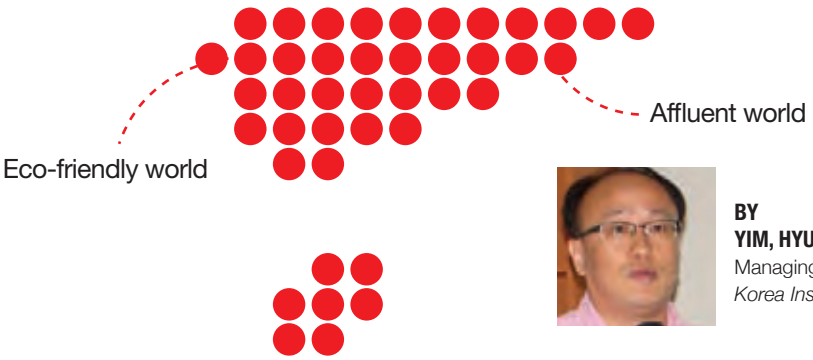
Key Environmental Changes for the Future of Korea
Intensified Environmental & Resource Issues
Advancement of Knowledge-based Society and Globalization
Acceleration in Convergence of Science & Technology
Changes in the Population Structure
Emergence of New Security Issues
VISION
Build a society which makes dreams come true to enhance the quality of life
25
Future Critical Technologies
5
Policy Directions
GOAL
One of the world's top 5 advanced nations in S & T



Science and Technology Vision for the Future

Toward The Year of 2040



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Managing Director, Technology Foresight Center
Korea Institute of S&T Evaluation and Planning

4

Future worlds to be realized

Coex Center in Seoul, South Korea

Seoul Plaza, South Korea 2

The creation and acceptance of new technologies has accelerated in modern times. In future, science and technology will be a key driver of social change. While the convergence of science and technology will speed up the creation of new technologies and industries. Admittedly, there are significant uncertainties about the future shape of markets, governance and social values. These will impact organizations and inf uence their capacity to meet their objectives.

In order to prepare for these rapid changes and uncertainties, we should actively respond to future society by establishing a national science and technology vision that incorporates changes in the global environment and the unique conditions of Korea. It has been also more than ten years since the 1st Korean S&T vision, 'Dream, Opportunity and Challenge of S&T Toward the Year 2025 (1999)' was devised. There is thus a need to formulate a new science and technology vision for the future in Korea. The vision will provide a new guideline for scientific and technological development in order to actively respond to the sharp changing future society. This is also expected to present citizens with dreams and hope, and scientists and engineers with a future direction and goals for the development of science and technology. This vision has been formulated through the following process.

Firstly, we have analyzed changes in the global environment and unique conditions of Korea to define a direction for changes in the future environment. Five megatrends are presented, which are meaningful for Korea in 2040. The five megatrends are (1) Intensified environmental and resource issues, (2) Globalization and the advancement of the knowledge-based society, (3) Changes in the population structure, (4) Acceleration in the convergence of science and technology, and (5) Emergence of new security issues. In-depth analysis of the relevant issues for each megatrend is conducted to identify a direction of change. Based on these analyses, we derive a vision and goal in the area of science and technology.

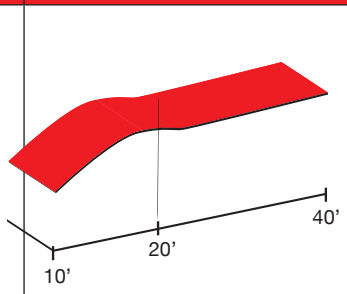
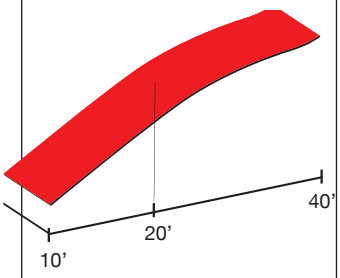
Secondly, the future society of 2040, when the vision is achieved, is concretized into four types of worlds such as natural world, af uent world, healthy world, and convenient world. Natural world takes place by developing clean energy and maximizing the reuse of resources. In the af uent world, a new industrial/economic structure is formed, owing to materials and production methods that are based on a new concept and green revolution. For a healthy world, incurable and terminal diseases can be treated, state-of-the-art medical services can be provided, and there are no concerns related to security or safety in daily life. For convenient world, there is unrestricted information exchange, resulting from the establishment of a ubiquitous ICT environment, and convenience in daily life is substantially improved through robot services.

Incurable and terminal diseases can be treated, state-of-the-art medical services can be provided, and there are no concerns related to security or safety in daily life.

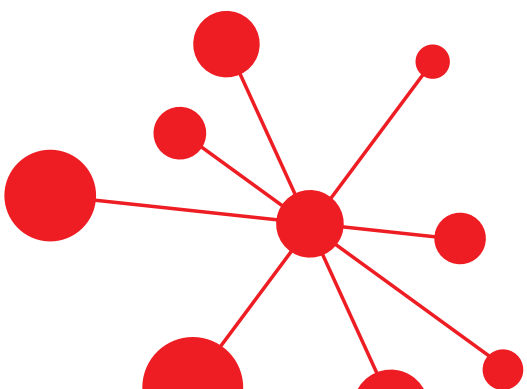
Finally, future key technologies and policy directions are proposed to achieve the vision and goal, i.e., to create the four types of worlds. In order to identify future key technologies, candidates that had a high possibility of contributing to building the vision were collected from existing science and technology plans. The final list of 25 future key technologies is selected from the candidates through SWOT analysis and expert surveys. The

Photo Credit (left): Uli Braun
Photo Credit (right): David Hart

25 Key Technologies

Category	Short to mid-term	Long-term
Overview		
	Technologies that require the nation to secure technological competitiveness by making concentrated investments over the next ten years and make continuous investments afterwards	Technologies that require the nation to prepare for the future by making cont nuous investments and that will contribute to ma ntenance of national competitiveness
Natural world	New and renewable energy technology	
	High efficient energy technology, Waste resource recycl ng and mineral resource technology	Technology nvolved with monitoring and respond ng to climate change, Technology nvolved with prevent ng and manag ng pollution resources and assess ng ecological risks, Technology used to reduce the emission of greenhouse gases
Affluent world	Cutting-edge, functional material technology	
	Manufacturing/production technology that converges new technologies, Technologies related to the knowledge service industry, Production robot technology for the manufacturing industry, Advanced agricultural biotechnology	Advanced, environmentally friendly logistics technology
Healthy world	Technology used to respond to new types of infectious diseases, Technology used to manage dangerous substances, Technology to build a safe liv ng environment	Pharmaceutical technology based on a new concept, Brain research and bra n disease treatment technology, Silver-industry and u-health technology, Military technology to prepare for future war
Convenient world	Ubiquitous computing technology, New media content technology, Virtual reality technology, New transportation technology	Service robot technology, Technology used to develop safe and pleasant spaces

25 future critical technologies are divided into 2 groups according to the investment strategy. For the short to mid-term investment, we should focus on acquiring technological competitiveness by making concentrated investments over the next ten years and make continuous investments afterwards. Technologies related to resolving pending issues, such as new types of infectious diseases, parts and materials, and energy-related measures are included in this group. The green technology that requires the country to preoccupy an advantageous position in the world market and new growth engines that can generate added value are also included. For the long-term investment, we should prepare for the future and contribute to the maintenance of national competitiveness by making continuous investments. For this group, technologies that prepare for the aging society and that realize a safe society are included. World-leading advanced technologies, original green technologies, and new growth engines whose markets have not been fully formed but have great future growth potentials are also added.



Myeong Dong Shopping Streets, Seoul

Five policy directions represent the general directions for S&T policy that the government should continually focus on to lead the future. The first policy direction is to expand creative and leading R&D. A support for challenging and adventurous research as well as multidisciplinary research should be strengthened to identify new growth engines. The government should make concentrated investments in basic research that has a high risk of failure in the market, encourage expansion of private sector investments, and establish an environment for the startup of innovative venture companies that develop new technologies. The second one is to cultivate science and technology experts and strengthen the knowledge system. The education and research system should be reformed so that researchers' creativity and autonomy is respected. The government should also put more emphasis on soft power such as standards and knowledge capital. The third one is to advance S&T innovation system through international cooperation. Open innovation through strategic international cooperation in science and technology should be promoted in order to overcome the issue of limited resources in Korea and to strengthen global science and technology competencies. The government should facilitate strategic joint research with advanced countries and strengthen reciprocal support with developing nations. The fourth one is to move forward with green growth-based technology innovation. Green technology innovation capabilities should be facilitated for the virtuous cycle of economic development and environmental preservation. The government has to strengthen the system for encouraging private sector investments in the development of green technologies and products. The last one is to strengthen the roles of science and technology in contributing to citizens and society. The roles of science and technology should be facilitated in resolving social issues. The government should increase roles of government R&D in contributing to the improvement of the quality of life, including citizens' health, safety, and environment. The government also has to enhance the social responsibilities of science and technology and disseminate the culture of science and technology.

Open innovation through strategic international cooperation in science and technology should be promoted in order to overcome the issue of limited resources in Korea and to strengthen global science and technology competencies.

Once the vision is realized in 2040, Korea will be one of the world's top five nations in science and technology that performs as a global leader. Korea is also expected to be a society that raises the value of life and that makes the dreams come true through the development of science and technology. The Korean government is currently working to spread dreams and hope among citizens by presenting a developed image of Korea of 2040 that will be realized through science and technology.

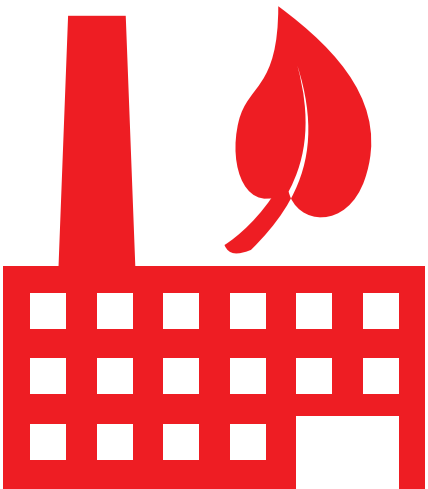


Photo Credit: Fabel Nard

Revolutionizing the Business Scene;

ECER's Palm Oil Industry Initiative - Palm Oil Industrial Cluster (POIC)

BY
I.M. NASIR & ZURINA ZULKIFFLY

ECERDC's POIC Study figures prominently in the article below. Located in Kuantan, Pahang; POIC is a unique proposition and it is envisioned to drastically impact the industry in the very near future giving the nation and its people a new sense of confidence and wealth opportunities in its economic mainstay – the Palm Oil Industry.

The general advances in technology, mechanization, and R&D within the industry, beginning with planting management and yield increments onwards through to palm oil-based downstream manufacturing is increasing the competitiveness of the industry vis-à-vis the other oils/fats crops.

Photo Credit (from left): Nicolas Raymond, Rodrigo Gelmi Mariano de Freitas, Søren Faurby

industry insights

Oleochemicals; chemicals derived from palm oil.

VALUE CHAIN MULTIPLIERS ARE MUCH BIGGER DOWNSTREAM

In short, the obvious fact is that the value chain multipliers are much bigger downstream, which was why POIC was initiated, and why the recommendations to overcome challenges to the industry centers on expanding downstreaming activities; making diversification downstream, an integral part of initiative.

In the Study which was conducted by the MIGHT/MPOB team, the sectors identified for inclusion into POIC are Phytonutrients, Oleochemicals, Food, Biomass, Biodiesel, Bio Fertilizer and Animal Feed. The identification was based on the trends, demand/market and performance of each industry that is seen to experience steady increase in production and to be of high value-adds. For instance, in one of the major identified industries – Oleochemicals; these chemicals derived from palm oil are used as the starting materials for the production of surfactants (Functional ingredients). These surfactants are then used to formulate consumer products.

POIC IS PREDICTED TO TRANSFORM AND REVOLUTIONIZED THE OLEOCHEMICALS SECTOR.

With a current capacity of 2.68 million tones, Malaysia is recognized as the world's largest center for Oleochemicals production. The introduction of this sector within the industry has allowed Malaysia to shift from the labor intensive (Plantation) to a capital intensive sector. The potential of the Oleochemicals in the derivatives and further downstream sectors however, have not been fully explored. This is one instance where POIC is predicted to transform and revolutionized the sector to ensure Malaysia realize the potential and opportunities that comes with it.

In devising its development strategies, steps were taken systematically; beginning with the formulation of the Business Model. The salient aspects of the POIC Business Model include key resources, key activities, partner networks and finance. Among the key resources is Manufacturing Flagship (PalmBiC), Business/Technology Incubation Center, Cluster Brokers Center, One-stop Authorization Center, Palm Oil Financial Investment and Trading Center (ProFIT), Bonded warehouse along with Hub Management Team.

Significant activities in the offering of the Value Proposition concerns Facilities Management and Maintenance as well as Marketing and Promotions.

Main partners for POIC at the initial stage are namely Kuantan Port City, Cargo Companies, SME Corp, R&D Institutions, Training and Academic Institutions, Other Technology/Business/Science Parks and/or Industrial estates and their Affiliates.

2.68

MILLION TONES
Malaysia is recognized as the world's largest center for Oleochemicals production.

Photo Credit (right): Auro Queiroz

In order to safeguard its survival and to continue offering its Value Proposition; and to justify its ultimate existence, POIC requires a source of income. The sources of income in this instance consist of Sales, Leasing Fees, Management Fees, and Facilities/equipment Rentals. The cost structure for POIC on the other hand, deals mainly with the constitution of the expenses; which in this case are, the Hub Management and Maintenance; and Hub Marketing and Promotions. Both activities would consume a bulk of the monetary resources available to the hub.

POIC Key Strategies concerns regular interface between POIC stakeholders, addressing the gap between R&D and commercialization, working with dedicated academic institutions, methodically dispensing customized incentives and grants and creating a platform for "knowledge spillover effects" from large firms to SMEs.

The site earmarked for the proposed POIC covers 246.96 hectares of greenfield land in a major development corridor between Gebeng Bypass and Federal Route 3 (Kuantan/Terengganu). Identified as part of Phase 3 of the Gebeng Industrial Estate, the POIC site is located inside the proposed Kuantan Port City Development. About 5 km north-west of the existing Kuantan Port, the POIC site is regarded as one of the key industrial clusters to be developed over the next twenty (20) years.

POIC IS LOCATED WITHIN THE KUANTAN PORT CITY DEVELOPMENT DOWNSTREAM.

The strategic location of the POIC site is further aided by an existing freight rail connection between Kuantan Port and Kerteh. Its locational advantage as an industrial park and accessibility and connectivity by land will be further strengthened when the Gebeng Bypass-East Coast Highway elevated interchange and the 40 m arterial distributor road proposed under the Kuantan Port City Development are completed.

The planning of the POIC is based on the premise of creating a comprehensive and integrated industrial park that is self-sufficient and self-contained and based on the concept of the "5 Integrations" which includes the Integration of Production Projects, Integration of Warehousing, Logistics and Transport System, Integration of Support Facilities, Integration of Public Infrastructure and Utilities and also Integration of Environmental Management and Monitoring Facilities.

It was proposed that POIC's development is implemented in two (2) phases due to the physical scale of the development as well as the size of the investment and capital cost involved. Equally important, phased development also allows the State government and its investment partners van opportunity to review the projects and their implementation program to ref ect market conditions, market demand and materials supply.

ECER's Major Land Uses

Total Land Area for Oil Palm

Johor	687,906	712,448
Kedah	77,080	78,384
Kelantan	103,636	113,185
Melaka	48,408	51,193
N. Sembilan	171,647	166,501
Pahang	647,870	675,667
P. Pinang	13,001	13,588
Perak	353,022	373,854
Perlis	251	235
Selangor	135,529	139,544
Terengganu	161,880	165,216
P.Malaysia	2,410,028	2,489,814
Sabah	1,333,566	1,361,598
Sarawak	744,372	839,748
Sabah/Sarawak	2,077,938	2,201,346

Total ECER = 954,048 Ha. (exc. Johor)

+ ECER produces 2 M. tonnes of palm oil (mainly CPO).
+ 75 palm oil based company
+ (54) Pahang
+ (12) Terengganu
+ (8) Kelantan
+ 881,897 Ha (37%) of land classified as agriculture in ECER (2,689,679 Ha)

Source: MPOB and ECER Study.

Adapted from the park management model adopted by Sembcorp in Batam and Vietnam, it was proposed that POIC is developed by State in partnership with ECERDC. Regardless of whether POIC is developed solely by State initiative or as a State-Private partnership; it was proposed that the management of the industrial park be assigned to a private limited company.

The establishment of POIC will support the development of a comprehensive downstream palm oil based cluster; building upon its strength on the availability of vast palm oil plantations hinterland (More than 900,000 Ha); large number of palm oil processing firms (54 firms); and high gross palm oil output of RM 6.25 billion (2005) in the Eastern Region, serving as a catalyst in creating the value chain of palm oil and related supporting industries, as well addressing the leakage of palm oil exports from the region. As a result of the setting up of POIC in and around the Gebeng area, there will be lots of new job opportunities generated by the new industries involved in palm oil products-linked companies.

AS PART OF ECER, POIC'S SUCCESS IS IMPERATIVE FOR THE DEVELOPMENT OF THE REGION AND NATION WHILST ENSURING THAT THEY ARE ULTIMATELY BENEFICIAL TO THE PEOPLE.

POIC is also a starting point for a larger notion that would in due course feature as a hub. Since POIC will be the showcase for the Palm Oil Industry, it is essential to ensure its creation is comprehensive and sustainable. As part of ECER, POIC's success is imperative for the development of the region and nation whilst ensuring that they are ultimately beneficial to the people on the socioeconomic front; customers/clients with the more extensive product choices; Industry through initiating new sources of growth; stakeholders on the return on investment (ROI); and Nation in terms of wealth and prosperity.

industry insights

Future of Natural Rubber: Invest In New Ideas

BY
DR AHMAD IBRAHIM

Revenue from petroleum is now a major income source for the country. Not very long ago, it was natural rubber (NR). Now however, NR plantation has been mostly replaced by oil palm. This is because palm oil gives better returns. But this does not mean NR is no longer important. NR still brings in sizable revenue for the economy. The export of rubber products, especially latex gloves, earns millions every year. If we add the earnings from the rubber-wood furniture export, we can safely say NR is still a major economic force. But is this sustainable?

Can we bring back the glory of NR? It is not impossible if the right strategies are put in place. In recent years, NR prices have shown positive trend. The price has even reached a high of more than RM10 per kilogram. This was never before achieved. Investors are re-evaluating NR. Its tag as a sunset industry is now being critically re-assessed. Is NR bouncing back? Some say it is still too early to make any conclusion. But the signs are encouraging. The spike in prices has been mainly linked to the surge in oil prices as well as the escalating demand in China. And experts agree that both the world oil price and the pent up demand in China will remain bullish for many more years to come.

For Malaysia, income from oil export will start declining once the country becomes a net importer. This is expected to occur in a matter of less than ten years. We need to explore other income sources. Will NR be an option for the country? How can we sustain the present bullish spell of the NR business? Is there a role for science, technology and innovation, STI The Academy of Sciences Malaysia recently teamed up with the Malaysian Rubber Board to explore such opportunities. A forum was held to discuss how Science and Technology can chart new directions for the country's natural rubber industry. The verdict from the meeting was that NR can bounce back if the right strategies in STI are pursued.

We now live in a new global business environment. Country borders have mostly disappeared. Goods can move easily between countries. Competition is growing more intense. Consumer expectations have also changed. Increasingly, products which negate environmental well-being are less preferred. Buying environmentally friendly products or green purchasing is becoming more popular. In fact green procurement has even become regulatory practice in many countries. In line with that, there is also a growing preference for natural and renewable materials. NR is definitely natural and renewable. This means NR can command a preference over synthetic materials in the green economy. This can be further enhanced with the right strategies.

At the moment, NR as a whole is still a thriving global business. The world NR production has increased from 6 million tonnes in 1995 to 9.6 million tonnes in 2009. Consumption has also increased to 9.5 million tonnes. Demand is not a problem for NR. Among the NR producing countries, only Malaysia has shown a decrease in production. The biggest increase is in Vietnam, where production has jumped by more than 489% for the period 1995-2009. Malaysia's production

NR can command a preference over synthetic materials in the green economy. This can be further enhanced with the right strategies.

Photo Credit (from right): John Nyberg, D. Sharon Pruitt, Katerina Chuchuva, Antonio Jiménez Alonso

industry insights

has decreased by 21% during the same period. The NR acreage in Malaysia is also on a downward trend. Can something be done to stop the decline? How do we inject new vigour in NR?

NR consumption in Malaysia is about 595,000 tonnes, of which more than 470,000 tonnes end up as latex products. Malaysia is now the world's largest consumer of latex concentrate, world's largest supplier of medical rubber gloves and world's largest supplier of latex thread and cord. The import of NR into the country has been on an increasing trend. In 2009, total NR import has exceeded 730,000 tonnes. Export has however declined to about 700,000 tonnes. With the decline in rubber cultivation, not only is the export revenue decreasing, but equally worrying is the growing dependence of the downstream sector on import. This may not be sustainable because as soon as the other producing countries start expanding downstream, they will have less latex concentrate for export. This means Malaysia's latex products sector will be adversely affected.

It has been predicted that in 2018, the world rubber consumption will reach 28 million tonnes. NR share is expected to increase to about 50% in 2018. 65.5 % of NR consumption is now in Asia. China leads the NR consumption in Asia. 80% NR end up in tyres where Asia is now a dominant market for NR. So the question of lack of demand does not arise at all. But supply may face challenges. There are constraints on further yield improvement. Climate change is one factor. There is now more rainy days, higher morning temperatures affecting latex f ow, extended wintering days and the emergence of new diseases. All these will contribute towards the growing tightening of supply. This may have been partly responsible for the high prices.

How can we arrest the decline in the rubber areas in Malaysia? The industry may have to rethink its policies to drive the growth of the rubber business. Malaysia is now behind Thailand and Indonesia in NR production. In fact very soon the production in India may also exceed Malaysia's. Though oil palm has taken most of the areas earlier under NR, there are still sizable areas available. There are areas in the dryer North where oil palms do not perform as well. Why aren't big plantations venturing there? For that matter, why aren't big rubber plantation houses venturing into Indonesia and the other emerging rubber growing countries? They do that in oil palm but not rubber. Why? At the same time we see China and even Vietnam already looking beyond their borders to plant NR.

There is no reason why the glory days of NR cannot be brought back.

Supply may face challenges. There are constraints and climate change is one factor.

The focus should be on new and unique downstream technologies in latex products and the dry rubber products which will strengthen Malaysia's position as the place to manufacture rubber-based products. The Malaysian NR industry should capitalise on the growing green consumerism movement in the world. Modification work on NR, whether chemical or biological, should be a useful research area not only to develop new materials but also to improve the properties of NR vis-a-vis competing materials such as synthetics. The rubberwood sector, now an important revenue earner for the industry, needs careful planning to further strengthen the sector. These would include the forest plantation programme and other process improvement research.

Research in the basic science of NR and also the non-rubbers in the latex will need a new vigour. We also need to research new rubber-like materials which can complement NR in production. For all you know, it may be another rubber producing crop. Already we hear of a promising rubber crop which produces latex without the allegernic proteins associated with Hevea. We have to explore this. New breakthroughs in genetic engineering have made it technically feasible to deploy the rubber tree as a biofactory for various products including pharmaceuticals and fuel. The potential application of nanotechnology to further improve NR properties calls for serious research. Whatever it is, technology holds the key to the future of NR in Malaysia. It would therefore be strategic to establish a technology intelligence group tasked with the responsibility to scout for and collate information on global technology developments related to the NR industry and undertake the relevant technology foresight studies.

It is clear that with the emergence of new scientific tools, NR can harbour new hopes. In fact, with the right investment in scientific R&D, there is no reason why the glory days of NR cannot be brought back.

Photo Credit: Konstantinos Dafalias

10 Technologies To Watch

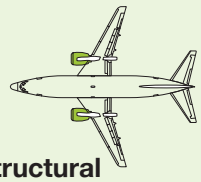
Technologies that could impact MRO

The aviation industry will see variety of exciting and challenging developments in 2011. Highlighted are 5 technologies that have the most potential for changing the aftermarket landscape in 2011 and beyond.

1 Automated Identification Technology (AIT)

AIT is a suite of technologies that enable and facilitate the accurate capture and rapid transmission of machine-readable data to automated information systems (AIS). AIT reduces administrative and logistics costs in a wide variety of applications by increasing data accuracy (eliminating errors), speeding the collection and transmission of data, and making the entire data entry/collection process more efficient. For example, AIT can assist in the data collection needed to achieve logistics, medical, and personnel functions. AIT provides a reliable and consistent means to identify and track marked items as they move through the supply and maintenance pipelines.

2 Structural Health Monitoring



The SHM process involves (1) the observation of a system over time using periodically sampled dynamic response measurements from an array of sensors, (2) the extraction of damage-sensitive features from these measurements, and (3) the statistical analysis of these features to determine the current state of the system's health. For long-term SHM, the output of this process is periodically updated information regarding the ability of the structure to perform its intended function in light of the inevitable aging and degradation resulting from operational environments. After extreme events, for instance earthquakes or blast loading, SHM is used for rapid condition screening and aims to provide, in near real time, reliable information regarding the integrity of the structure.

3 Aircraft Health Monitoring

Health Monitoring System is a form of system diagnosis, in which the goal is to detect system failure and identify, which component is responsible for it. In monitoring, the diagnosis is based only on observations derived from signals originating from built-in sensors and detectors, e.g. pressure sensors or valve position detectors. It does not take into account the symptoms of failure, e.g. abnormal sounds or vibrations, or measurements performed by means of external devices, such as portable testers, which are often used during troubleshooting of the aircraft systems in repair shops. Although health monitoring is limited to the built-in devices, it has an advantage of providing real-time health status either during the flight and/or soon after its completion. It is very useful for a go-no-go decision at the airport gate and may be of critical importance in decisions affecting loss of human life and/or damage to expensive hardware.

4 Energy Harvesting

The idea of energy harvesting—the process of converting energy from external sources such as solar energy, temperature differences or even body heat into energy that can power vehicles—may seem a bit far-fetched. That's a fair assumption, as scientists are only in the infant stages of testing materials and power systems with energy harvesting capabilities, especially for the aerospace industry. However, the concept of converting passive energy, if only to power low-energy components, could very well be relevant to aviation in the next few years. It is reported that companies like EADS Innovation Works, Honeywell, Airbus and Boeing are realising the idea and undertaking research projects to learn more about how the technology could realistically be used to power small components such as reading lights or even structural and aircraft health monitoring systems.

5 Engine Coating

A big trend in engine services is low thermal conductivity coatings. By adding rare earth metals to thermal barrier coatings, engineers at companies such as Pratt & Whitney with their Half-k coating and Chromalloy with the Low-k coating have reduced the conductivity of high-pressure turbine (HPT) blades and vanes by about 50%. Although the high price of the rare earth metals will likely make these coatings more expensive than the "standard k" coatings that preceded them, the low thermal conductivity coatings provide benefits such as less fuel burn and increased on-wing time for hot-section components.

The other 5 potential technologies to watch in the MRO industry including self-sustaining materials, artificial neural networks, nanotechnology, social networking- infused IFE and smartphones and tablet applications.

Source Overhaul & Maintenance Magazine, January 2011

Photo Credit: Konstantinos Dafalias

youth insights

Can Anime Create an Impact to Our Country?

BY
FATIN NURAMANINA

Bleach, Dragon Ball Z and Naruto Shippuden are among the many famous Japan animation that became a craze world wide.

Anime, a short abbreviation for 'animation' in Japan, is known as 'Japanese animation' in English-speaking countries. It is an industry widely known among youths, ranging in age from 4 until young adults in the late 20's. Its unique history dates back to the early 1910's and has continued to develop ever since. It has moved from simple watercolours, through to coloured pencils and inked pens, to the latest high-tech Computer-Generated-Images (CGI) and advanced technologies software to create a magnificent artwork of anime.

It's virtually like a virus spreading among the young. Its addictive story-line, beautifully made pictures and the effectiveness of the seiyuus or 'voice actors', all contribute to the growing fanaticism. Some of the anime originally came from manga or 'Japanese comics'. The success of some manga production including 'Naruto', 'Doraemon', 'Sailormoon' and many others has been an inspiration for anime. Even some adults have grown fond of these beautiful animations.

The industry of anime has generated a world-wide following by fans and the industry itself for more than a decade now. However, sadly it does not enjoy the appreciation of a majority. Even in Japan, those who love anime very dearly are considered a fanatic or otaku. They are often isolated and looked upon as weird and nerdy in the eyes of those who do not appreciate anime. Only about 45% people in the world are really interested in anime. The rest, especially adults around the mid-30s and above, do not give a damn about anime. It is the same in Malaysia. This explains why it is difficult to expand the anime industry here.

The anime industry has the potential to make beneficial economic contributions to our country. For example, young adults can express their talents by taking part in international competitions, studying animation production overseas and even produce their own animation! It is not impossible to attract the community to participate in this industry. We can make it possible if all parties give their fullest cooperation. We can even develop our own CGI technology software, without having to use Japan's technology, to produce our own animation.

So far, Malaysia has managed to produce local comics such as 'Anak-Anak Sidek', 'Kampung Boy' and many more in the form of 2D image animation cartoons. Such efforts have gained recognition both locally and foreign. As of now, Malaysia has advanced to the next level of the animated cartoons production by using CGI technology to deliver a local 3D image-like cartoon called 'Upin & Ipin'. This has once again caught the attention of many locals and foreigners, especially on the uniqueness of the animation. This goes to show that the locals are able to produce their own CGI animated cartoons.

One of the most popular Malaysian comics and animated cartoon is the 'Kampung Boy'. The 'Kampung Boy' depicts the early livelihood of an active young boy in a Malaysian village. The artwork was drawn by Lat, a local cartoonist who has enjoyed international fame for his work. His real name is Dato' Mohamed Nor Khalid. He became popular ever since he started to draw 'Scenes of Malaysian Life' comics, featured in the New Straits Times, a prominent English daily paper, in the late 70's. His care-free art style and light humor was then brought into life when the 'Kampung Boy' comics hit the global scene. Malaysia, Philippines and United States in fact joined hands to produce an animated series of the comic since 1995. Another Malaysian cartoon, also equally popular, is the 'Anak-Anak Sidek' or in English 'The Sons of Sidek'. The biography-comic was produced by the 'Kumpulan Pelukis J.A.S Sdn Bhd'. The animated cartoon version was released in the early 1990's.

Our country can benefit in many ways from the anime industry. Other than uncovering the hidden talents amongst our youths as well as increasing our country's own local animation production, it brings thousands and even millions of people together in events where anime exhibitions are held in many different places. In these events – 'Cosplaying' events to be exact – people can dress themselves as their favorite characters and even role-play those characters! Other than that, they can exchange cultural information and get to know their respective countries. Moreover, these kinds of events can help raise our country's image as one of the most cultured country in Asia alongside Japan, China and Korea.

However, as is often true there is also the unsavoury side. Some parts of the anime industry depict distasteful phonographic content – hentai or ecchi, overly-horrid horror images and even inappropriate wordings that are unsuitable for all ages. These materials are easily found in the internet for all to see. Some countries even ban the airing of anime through televisions, DVD sales in stores and manga sales when they know the dark side of the anime industry, fearing it might negatively inf uence youths.

Notwithstanding, we should pick the positive features of the anime industry. We should support studying animation both locally and abroad by our youths who show talents. The youths can contribute their ideas and knowledge of anime and manga production to the country. They can then produce their own Japanese-like local anime and manga to be seen, heard, read and felt by people globally.

A Letter From The Future

BY
DR KAMARULZAMAN

Dear Olli,

I hope you are enjoying winter in Lappland. I understand that this year's winter is harsh. Similarly the weather in KL has been really hot and humid and the city has been f ooded 4 times already this year! KLCC has been turned into a disaster-relief centre, but getting there can take hours.

Fortunately, most of the economic activities of the country have moved out of the city with no apparent impact. I am currently at my country home up north. Most of what I need is available, even my lawyers are available through V.R.

My business is growing. SAMSUNG has just given us a large contract for displays. Mr. Sohn, their chief product development engineer gave us the thumbs-up after evaluating our solution. I understand SAMSUNG is big in Africa now, serving 300 million middle-class populations.

Today I had a check-up for my prosthetic arm. It's looking good and I do not need the support anymore. With the new arm I can even take the proton out and blast the empty highways, safely I must add. Oh yes, I still do my weekend bike rides, the arm is perfect, almost natural I must add.

See you soon Olli, You must come and see my home here. Last night I heard tigers roaring, must be their mating season. I'll pick you up at the jetty as usual. Say hi to your wife and kids. My daughters are in the Middle East now. They are travelling to Palestine, now safe and peaceful, thanks to the European efforts.

Best regards,

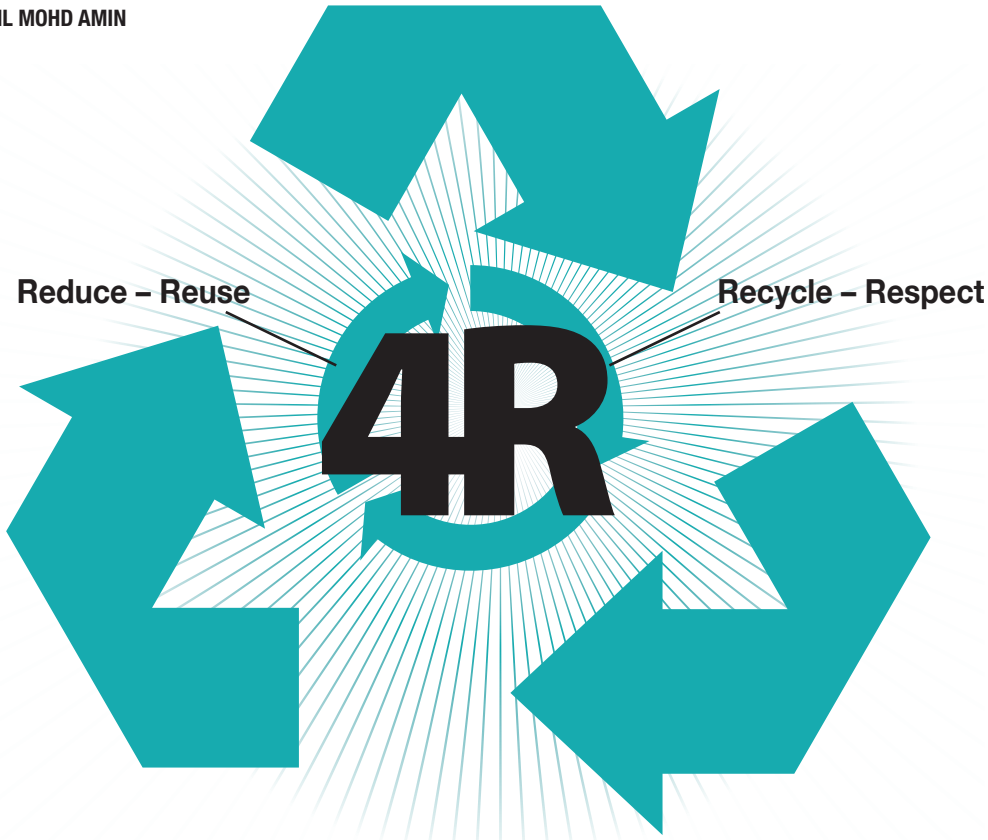
Dr. Kamarulzaman Mohamed Zin
Chief Executive Officer
Silterra Malaysia Sdn. Bhd.

Photo Credit: Ramasamy Chidambaram

trends & issues

Sustainable Consumerism

BY
AZMIL MOHD AMIN



Sustainability is the mantra nowadays. As the number of humans on the planet rose dramatically during the 20th century, world consumption is also increasing. The numbers released from the preliminary count report of the Malaysia Population and Housing Census 2010 indicates the total population of Malaysia now stands at 27,565,281. There are 105 males for every 100 females in Malaysia. Examining population trends over the past few centuries provides a perspective on current population growth. How does population and demographic change inf uence global consumerism and consumption pattern?

As a human being, we consume a wide variety of products. Sometime, we consume too much. Some of the things we consume are not cheap. These include luxury items and technologies for improved efficiency. Such extravagant consumption is not necessarily a bad thing, as throughout history we have always sought to find ways to make our lives better. However, increasingly nowadays, there are important consumerism issues that have raised global concern. We need to understand them better so that they do not end up harming us. For example, many now ask probing questions as to how products and resources we consume are actually produced. They want to know how the processes of production and consumption impact on the environment, society, and the individual. How does the escalating demand on various items put pressure on the environment? And how do consumption habits change as societies change?

Global consumption levels and patterns are normally driven by the rapid global population growth. With the rise in global wealth and associated consumption, the global middle class is expected to triple by 2030; the emerging Asian middle class presents an attractive market destination for products ranging from consumer goods to financial services. However, it still has a long way to go before it can match the level of consumption in the US. According to a Deutsche Bank Research report, compared to the lower-income households, the middle class, with their higher disposable income, have more diversified consumption choices. Therefore, the emergence of a large and dynamic middle class would raise Asia's profile as an attractive market destination for all kinds of products. Population growth and economic development are the forces which drive consumption around the world. This will continue unabated as billions of consumers – especially in China, India and the other emerging economies – join the buying spree.

According to Goldman Sachs, 70 million people each year enter an income bracket equivalent to between US$ 6,000 and US$ 30,000 in purchasing power parity terms. This phenomenon may continue for the next twenty years, accelerating to reach 90 million new middle-income consumers per annum by 2030. If this proves to be the case, then 2 billion people will have joined the ranks of the middle class by that date, bringing almost 80% of the world population into the middle-income bracket.

The current global consumption is putting increasing pressure on resources. This cannot be sustainable. For instance, according to a report on the Earth's ecosystems – 60% of the Earth's ecosystem services have been degraded in the past 50 years. Another matter concerns the supply of energy and material resources needed for industrial growth – the natural resource consumption is expected to rise to 170% of the Earth's bio-capacity by 2040. The impact towards human social systems and well-being is also significant – does human well-being necessarily rely on high levels of consumption?

The society needs to be educated. The businesses need to be educated. But how can these be done amidst complex societal demands and growing business competition? In case of businesses, business approaches to sustainable consumption can be grouped into three broad categories. First is innovation – business processes for the development of new and improved products and services. Business is shifting to incorporate provisions to maximize societal return and minimize environmental cost. Next is choice influencing- the use of marketing and awareness-raising campaigns to enable and encourage consumers to choose and use products more efficiently and sustainably. Last but not least is choice editing – the removal of "unsustainable" products and services from the marketplace in partnership with other actors in society. Recent development has shown that consumer attitudes and behaviour towards consumerism have shown an increasing concern about environmental, social and economic issues. Many are also increasingly willing to act on those concerns. Nevertheless, consumer willingness often does not translate into sustainable consumer behaviour because of a variety of factors – such as availability, affordability, convenience, product performance, conflicting priorities, scepticism and force of habit.

Despite significant shifts in the levels of awareness, concern and general attitudes towards environmental and social issues, many consumers have not made the same shifts in general behaviours, lifestyles and purchasing decisions. Most of the products available in today's supermarkets carry a wide range of labels. These include on-pack claims and elements of design meant to inform and reassure consumers on health, safety, environmental or social concerns. Several brands, including grocery retailers, have developed their own labels; other brands use endorsements from non-certifying (but trusted) third parties,

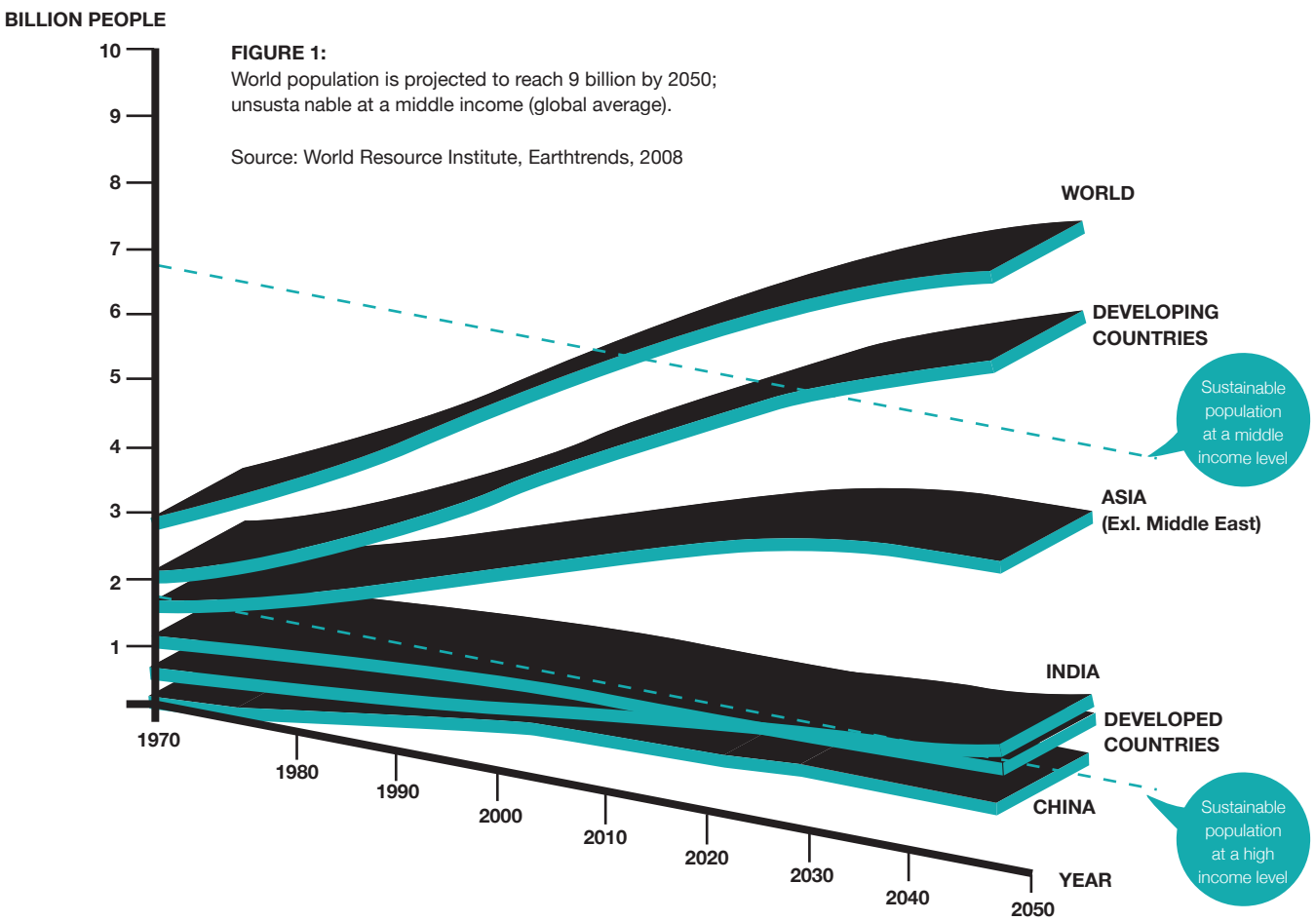


FIGURE 1:
World population is projected to reach 9 billion by 2050; unsustainable at a middle income (global average).

Source: World Resource Institute, Earthtrends, 2008

trends & issues

or on-pack claims (such as "natural") to convey sustainability attributes. Some products are certified by an internationally recognized and respected body, such as a local, national or regional authority. Along with these labels, producers are also obliged to provide nutritional values and information on a full list of ingredients.

Consumers International and the UK's National Consumer Council report that many consumers remain confused about which products are better for society and the environment. Nevertheless, labels can play an important role in fostering sustainable consumption when used as part of a package of measures.

Many of the early products designed to be environmentally responsible, such as electric cars and recycled paper, did not meet the basic expectations of consumers. Rightly or wrongly, these early disappointments have made it tougher to convince today's consumers that green products work as well as those that they are intended to replace, or are worth higher prices. In their search for guidance on consumption choices, people trust each other more than any other source of information.

THE CHALLENGE AHEAD

In order to be able to lead sustainable lifestyles based on informed purchasing decisions and changes in behaviour, consumers need the support of all: business, governments and civil society. Early steps should be taken to promote efficiency in production processes and reduce wasteful consumption in the process of economic growth, taking into account the development needs of the nation. At the governmental level, the needs to develop a domestic policy framework that will encourage a shift to more sustainable patterns of production and consumption are urgent. Promoting to reinforce both values that encourage sustainable production and consumption patterns and policies that encourage the transfer of environmentally sound technologies is imperative. Moving forward, business and industry need to engage in further dialogue with stakeholders - consumers, retailers, marketers, policy-makers, NGOs, and between businesses to define sustainable products and lifestyles and to formulate actionable responses.

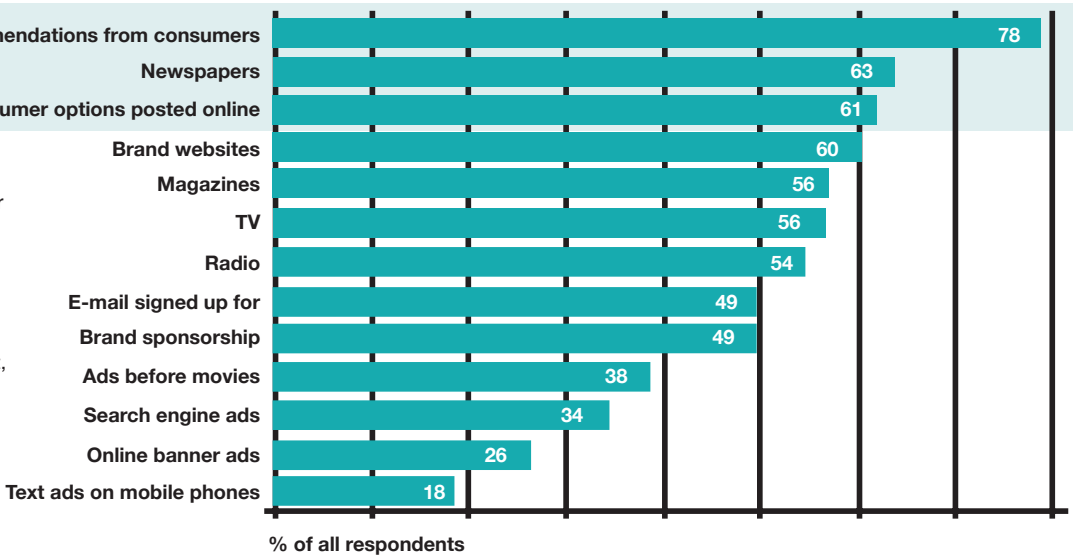


FIGURE 2:
Consumerism trust other consumer most

Source:
Nielsen, Trust in Advertising, a global Nielsen consumer report, October, 2007

Photo Credit (left): Robert Davey
Photo Credit (right): Allie Hylton

Obesity: A Growing Health Risk



BY
FARAH ABU BAKAR, NATRAH MOHD EMRAN
PRISCILLA ANNABEL

The adult obesity rate in ASEAN is on the rise. In 2010, Malaysia was ranked sixth by the World Health Organisation (WHO). The Ministry of Health reported that 60% of Malaysian aged 18 and above had a body mass index (BMI) of over 23. Body Mass Index (BMI) is a measure of weight divided by height squared. BMI value of 23 to 24.9 indicates overweight, while a reading above 25 means obese.

Obesity is a growing problem in our country. It could lead to numerous serious health consequences such as diabetes, heart attack, kidney disease, high cholesterol and high blood pressure. To date, 14.9% and 43% of Malaysians aged above 30 suffer from diabetes and hypertension respectively. 20.7% of adults over 18 suffer from high cholesterol. This is indeed an alarming figure. Added to that, obesity in the younger generation which includes children is also increasing.

Many may wonder what contributes to obesity. In fact, most would associate bad eating habits directly to obesity. However, there are other contributing factors as well. Malaysia has always been known as a food heaven. Our diverse culture has inf uenced our way of eating and our lifestyle. It is true indeed that Malaysians do eat around the clock. This is made worse with the blooming of 24-hours food joints such as mamak stalls, fast food restaurants etc. The poor eating habits are worrying. It is known that a high consumption of fat and meat would increase body weights. This would lead to obesity and the consequent diseases.

Exercise is another way to prevent obesity. However, many of us give a lot of excuses not to exercise. Some of us refuse to even practise simple daily routine such as walking to nearby shop, or school or even office as part of our exercise regime. Many would prefer to use the elevator rather than taking the stairs. As a result, the bodies accumulate more fats.

To some people, eating is considered as a stress reliever and gives comfort. This group of people are also known as emotional eater. Whenever they are in stressful situation, they tend to eat more, hoping to divert their mind from thinking about their problem. This is a wrong thinking.

Studies have shown that obesity can also be passed on genetically. Obesity tends to run in families, suggesting that it may have a genetic linkage. However, family members share not only genes but also diet and lifestyle habits that may give rise to obesity. Separating these lifestyle factors from genetic ones is often difficult. Notwithstanding, there is a growing evidence pointing to heredity as a strong determining factor of obesity.

We can see many among us who are obese as a result of unhealthy eating. They can be our siblings, office mates, neighbours, or in fact almost anyone. Due to extreme weight gain, they often have difficulty breathing and suffer from other health complications. Undergoing costly gastric bypass seems to be their last resort.

Realizing the seriousness of this issue, the Ministry of Health will employ 300 nutritionists to serve at government clinics nationwide to help tackle the growing obesity problems. Their job is mainly to create more awareness on the dangers of unhealthy eating. On top of that, the Malaysian Council for Obesity Prevention (MCOM) was launched in April 2010. This comprises 13 professional bodies and NGOs and was set up to help the government counter the problem of obesity in the country. Besides that, there are other aggressive health campaigns that had been launched by the Government and NGOs nationwide in order to address this concern.

The Biggest Loser show is one of the most popular awareness programmes promoting the healthy way to lose weight, teaching us not only to practise healthy dieting, but also undertake consistent exercise regime. The progress in terms of food intake, exercise routines and the psychological wellness of participants is being monitored by professional trainers. All of the results are shared with viewers. The programme helps inspire viewers to opt for a healthy lifestyle.

With all these initiatives, it is now up to us whether we want to end up being obese or otherwise. As Shakespeare once said, "to be or not to be". We should also ask ourselves, do we live to eat or eat to live?

To date, 14.9% and 43% of Malaysians aged above 30 suffer from diabetes and hypertension respectively. 20.7% of adults over 18 suffer from high cholesterol.

The World Moving Forward

SWITZERLAND

Creating Smarter Railroad us ng IBM Technologies for passenger and logistic transport.

ITALY

Italy has come up with world's first hydrogen power plant. This hydrogen power plant is an off shoot of the Env ronment and Innovation Project known as Hydrogen Park. 7.4 billion euros will be assigned for the whole project by 2012. Another 40 million euro plant will be established on the line of Enel's exist ng coal-fired power station in Fus na. It will have an investment of 4 million euros from the local Veneto region. According to Enel this power plant will save the emission of more than 17,000 tonnes of carbon dioxide a year. This power plant has a capacity of 12 megawatt and burns hydrogen gas in a turb ne.

CANADA

BMT Fleet Technology, of Ottawa, Ontario has announced its collaboration with the University of Victoria to design and deliver North America's first ever hybrid, electric research ship. The vessel, formerly known as CCG Tsekoa II, will be used by the University as a research facility off the British Columbia (BC) coast to investigate changing coastal ecosystems, marine resources and cont nental she f and slope dynamics.

UNITED KINGDOM

Funds of up to £350K are be ng made available by BBSRC (up to £250K) and MOST (Vietnam) (up to £100K) for a project to sequence the genomes of 30 rice varieties that have been selected for high quality and yield potential, tolerance to submergence, salinity, drought and resistance to pests and diseases, and to transfer this knowledge into new rice varieties. The aim is to mprove food availability and security.

MEXICO

The Mexico City's Green Plan (Plan Verde) has seven pillars: Land conservation, public spaces, a r pollution, waste management and recycling as well as water supply and sanitation, cl mate action program, transportation and mobility." The plan is designed to reduce overall emissions by seven million metric tons from its inception in 2008 until 2012.

KENYA

International Fund for Agricultural Development (IFAD) has also mobilized additional cofinancing of about US$68 million from other donors. The Government of Kenya and project participants have contributed about US$56.0 million and US$11.0 million respectively to secure food availability for the nation.

NIGERIA

The Eko Atlantic Project- est mated to worth 33 billion for the expansion to continue at a breakneck speed and part of the expansion plans for Lagos include an ambitious new city within a city.

GERMANY

Big North Sea Wind Farm

To build a massive offshore wind farm n the North Sea at a cost of about 1 billion euros ($1.4 billion). The DanTysk wind farm will consist of giant wind turb nes supplied by Siemens and spaced out over a 70-square-kilometer area about 70 kilometers (42 miles) west of the German island of Sylt. Construction is scheduled to begin in 2012 and to wrap up by the start of 2014.

Once complete, the 288-megawatt w nd farm is expected to produce about 1,320 gigawatt-hours of electricity annually. That's roughly enough electricity to meet the energy needs of 500,000 homes, assuming an average use of 2,500 kilowatt-hours per home, according to Vattenfall.

SOUTH KOREA

The First Full-Color Display with Quantum Dots

Samsung's new four-inch display could eventually lead to flexible screens.

Researchers at Samsung Electronics have made the first full-color display that uses quantum dots. Quantum-dot displays promise to be brighter, cheaper, and more energy-efficient than those found in today's cell phones and MP3 players.

World"s first ''smart ship"

South Korea has built the world's first "smart vessel" that can enhance operational efficiency and reduce management costs for shipp ng l nes, the government said Thursday.The ship built by Hyundai Heavy Industries Co.incorporates a new ship area network (SAN) system developed by the state-run Electronics and Telecommunications Research Institute, the Ministry of Knowledge Economy said.The SAN-equipped ship, to be launched on Tuesday, is a 250-meter long, 4,500 twenty-foot equivalent unit container vessel ordered by Denmark's AP Moller-Maersk, the world largest shipp ng line.

KAZAKHSTAN

The largest oil and gas reserves in the Caspian Sea bas n, and is producing 1.5 million barrels of oil a day today. It is projected to produce 2.5-3.5 million barrels of oil a day by 2015, surpass ng today's output by Qatar or Iraq.

CHINA

The world's first high-speed commercial magnetic levitation (maglev) line. With generous funding from the Chinese government's economic stimulus program, 17,000 km (11,000 mi) of high-speed l nes are now under construction. The ent re HSR network will reach 13,073 km (8,123 mi) by the end of 2011[4] and 25,000 km (16,000 mi) by the end of 2015.

VIETNAM

Largest Hydroelectric Power Station, 2400 MW expected in full operation in 2012.

UAE

Hydrogen Power Abu Dhabi is a 60/40 joint venture between Masdar and BP to build the world's first commercial-scale hydrogen-fuelled power plant utilising fossil fuel feedstock and Carbon Capture and Storage (CCS). Expected to pre-commissioning in 2014.

INDONESIA

Cut fossil fuel dependence by 12% come 2025, with the introduction of nuclear power.

MALAYSIA

The Malaysian Agricultural Research and Development Institute (MARDI) will champion the nitiative to ntroduce fragrant rice cultivation in non-granary (non-irrigated) areas and to market it as specialty rice. Success of this project will reduce the import of quality rice and will also increase farmer's ncome. Gross National Income (GNI) of RM133 million expected by 2020.

SAUDI ARABIA

Saudi Aramco and TOTAL SA signed a comprehensive Memorandum of Understanding (MOU) related to the development of a 400,000 barrel-per-day world-class, full-conversion refinery n Jubail, Saudi Arabia. The refinery will process Arabian Heavy crude and will produce high-quality refined products that meet current and future product specifications. The project is scheduled to be operational in 2013.

viewpoints

Tsunamic Tide of the Information Matrix
A Tale of Three Revolutions: Lessons for the Future

BY
MATHEW MAAVAK

THE INFORMATION AND COMMUNICATIONS REVOLUTION

On Sept 27, 2005, BBC's Magazine featured an analysis on the then curious world of blogging. [1] What motivates the online writer? Is it self-aggrandizement, a cool alternative to personal diaries, political activism and the accompanying need for secrecy? Or do blogs comprise works rejected by the mainstream media?

The answer lies in a combination of motives. The information matrix has changed. Within six years, blogs and online news sites would be amplified by cutting-edge information sharing tools such as Facebook, Twitter, and Digg and Delicious. Information is being trawled at unprecedented levels to satiate online tastebuds. The next wave promises to be augmented reality-based communications.

One immediate casualty of this information revolution was the mainstream media. The print media in developed nations began to fold up. Even the venerable New York Times is teetering on the brink of bankruptcy. Efforts to introduce online access fees backfired; essential news is still provided for gratis by the big four – Reuters, Agence France Press (AFP), Associated Press (AP) and Bloomberg.

A Blogger could now sift and process news from these four agencies to produce a superb analysis, way before a mainstream counterpart's report is publicly revealed in the morning edition. The mainstream media initially responded by publishing their reports online but could not match the blogging worlds output across all times zones and boundaries.

An accomplished blogger's analyses is able to outpace, and out-click, the products of once impregnable media establishments.

No longer will intelligent discourses be monopolized by a cabal funded by vested interests. Furthermore, the information and communication revolution enabled people-to-people, people-to-power and power-to-people engagements. The Prime Minister of Malaysia, Datuk Seri Najib Razak, is known to host tea parties for his Tweeting and Blogging buddies. [2] There is no better way to gauge views apart from those voiced in the corridors of power.

Rulers and high elected officials now augment their decision-making process through inputs from netizens. Failure to do so ends in another type of revolution -- in the open spaces of Tahrir Square instead of Cyber space.

Rank	Newspaper	As of March '09	Year over Year
1	USA Today	2,113,725	-7.5
2	Wall Street Journal	2,082,189	0.6
3	New York T mes	1,039,031	-3.6
4	Los Angeles Times	723,181	-6.6
5	Wash ngton Post	665,383	-1.2
6	New York Daily News	602,857	-14.3
7	New York Post	558,140	-20.6
8	Chicago Tribune	501,202	-7.5
9	Houston Chronicle	425,138	-14.0
10	Arizona Republic	389,701	-5.7

Source Audit Bureau of Circulations

viewpoints

viewpoints

The recent revolution in Egypt, proved the power of shared information.

PEOPLE'S REVOLUTION

The Great Arab Revolt of 2011 was sparked off by the self-immolation of a 26-year-old Tunisian youth named Mohamed Bouazizi. This fatal demonstration of despondency, fuelled by perennial unemployment, lack of opportunities and a corrupt power structure, opened up mass floodgates of frustrations throughout the Middle East and North Africa. Within two months, the Tunisian and Egyptians governments fell, with protests continuing in Yemen, Bahrain and Libya.

When information is curtailed and news monopolized, the resultant cleft between elite perceptions and street reality ultimately explodes into chasm of violent confrontation.

When peaceful protests are ignored, the disenchanted will no longer appeal to the common sense of their leaders; instead blogs, tweets, Facebook posts and (sometimes horrific) YouTube videos will began to canvass international sympathy. The final blunder begins when authorities press the internet kill switch, such as what happened in Egypt and Libya.

This is when the global blogging community dispatches satellite phones, satellite modems and provides "speak to tweet" facilities via conventional phone lines. Tutorials provide internet newbies with ingenious ways of circumventing an information blockade, including speedy set ups of makeshift radio stations.

Such crisis actions plans were long in the making. Harvard University and the global blogging network, Global Voices Online had long worked on a "Handbook for bloggers and cyber-dissidents."

It was therefore little surprise that major news organizations were getting their hourly fare not from journalists per se, but from the zenga zenga (meaning "every alley and avenue" in the North African Arab dialect), with the caveat that "this information (or video) cannot be verified."

The truth, in such situations, is often lost till one side prevails. The eminent historian Norman Davies had warned of overreliance on the emotive effects of images. "The historian, like the camera, always lies." [3]

For among genuine, mass grievances lurk the miscreants, sectarians, fifth columnists and the anarchists.

So, does the future of politics lie in the blogosphere? Yes and No.

Yes, political transformation will be greatly shaped by online citizen voices. The recent WikiLeaks disclosure only drives home that point.

No, the power of online activism is not absolute.

Saudi Arabia effectively contained a planned Day of Rage on March 11 by monitoring and subverting online dissent. It had a full six weeks to identify ringleaders and apprehend them before the planned day of protests.

Governments around the world are watching the growing power of the netizen with alarm, especially in the aftermath of the Great Arab Revolt of 2011, but the blogosphere is useful in another area.

Here, it plays a humanitarian role.

When information is curtailed and news monopolized, the resultant cleft between elite perceptions and street reality ultimately explodes into chasm of violent confrontation.

Japan triple tragedy - earthquake, tsunami and nuclear meltdown.

THE EARLY WARNING REVOLUTION

In cases of natural disaster, both the media and government apparatuses rely heavily on the man in the street for first-hand information. It provides situational awareness for the type and quantity of relief needed for a location. This job is traditional done by the psychological operations unit of an army.

When Hurricane Andrew devastated the US states of Florida and Louisiana in August 1992, a special Psyops taskforce from Fort Bragg's 82 Airborne Division was despatched to set up and coordinate relief efforts. [4]

In instances where a natural disaster hits multiple points and overwhelms local rescue services, information can be drawn from citizen journalists to help delineate relief efforts. This was demonstrated during the 2004 Asian Tsunami. Eye witness accounts, enabled by the Information Revolution, helped coordinate life-saving efforts.

In fact, an argument can be made that wired communities are better poised to guard themselves against disasters, provided ample warning time exists between the epicentre and vanguard waves of a tsunami tide.

The upper middle-class neighbourhood of Valmiki Nagar, Chennai, sustained only casualty in 2004, as prior information spread rapidly on the extent and type of dangers rushing to their shores. Poorer communities that did not have access to information, and for whom there was no word for "tsunami" in the rich Tamil lexicon, bore the brunt of the onrushing waves; dazzled as they were by the hypnotically transient recession of the coastline. [5]

Even when taken by complete surprise, a wired community is better prepared in a post-disaster area. Shell-shocked Japanese survivors of the recent triple tragedy – an earthquake, a tsunami and an ongoing nuclear meltdown – did not resort to anarchy and looting but were superbly trained to coordinate relief efforts with the authorities.

Tweets, blogs, cellphone video clips, and emergency podcasts enabled Tokyo and the global media to speedily discern the magnitude of the disaster and pinpoint areas that needed urgent attention.

If this triple disaster had occurred anywhere else – in a society much less wired -- the final death toll would have been incaculable.

What if this disaster had occurred in Egypt, Bahrain, or Libya?

Six years back, the BBC Magazine article referred at the beginning of this article had quoted a blogger, qannai, of the imperative need to "include a crisis action plan, where a blogger can alert others worldwide in cases of contingency." Any contingency! [6]

It wasn't just political.

Tweets, blogs, cellphone video clips, and emergency podcasts enabled Tokyo and the global media to speedily discern the magnitude of the disaster and pinpoint areas that needed urgent attention.

GRIDLOCKED TO THE FUTURE

We are all gridlocked to the same future matrix. Information-based web tools for political mobilization and protests can be used to educate our children, match-make singles, design the industries of tomorrow, report news as they happen and serve as an early warning system for our communities.

In fact, an integrated set of free web tools can be used by futurists as a horizon scanning tool, and thereby refine the predictive process. The foremost proponent of this method is the futurist Alex Pang. [7]

The biggest mistake right now would be to view evolving information and communications tools as a subversive element.

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viewpoints

Is There Hope for a Better Tomorrow?

BY
MOHD AFZANIZAM MOHD BADRIN

At the start of 2010, the world population stood at over 6.8 billion. Historically, global trends showed a doubling over the past 45 years. Between now and 2050, global population growth will be dominated almost exclusively by developing countries. In fact by 2020, 95% of the population will live in developing nations.

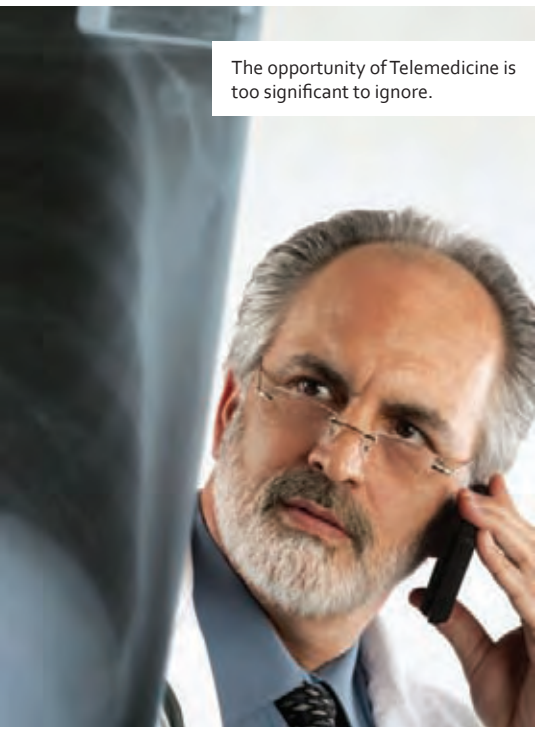
With the growing number of the aging population, coupled with the increase in chronic diseases, consumers of the future are likely to be older and may have to deal with many chronic diseases. According to a recent study published in Demography by James Banks, middle aged and older Americans have higher rates of chronic diseases and new incidences of disease than their peers in England. The aging boomers will transform future healthcare market. For one there will be increasing demand on the public health system as well as the medical and social services.

The expanding patient population globally has resulted in an increase in global healthcare expenditure. The major increase in healthcare expenditure is now being witnessed mainly in the developed nations where population is ageing at a higher pace compared to less developed nations. On average, between 1998 and 2008, the growth rate in per capita health spending in real terms was 4.9% per year in Asia, higher than the 4.1% observed across OECD countries.

Both the private and public healthcare market are facing new challenges. This is mainly due to the advancement and innovation in medical technologies that are taking place. Many hospitals are now equipped with state-of-art equipment. All are investments made to enhance service quality and faster delivery. Consumers are now able to take advantage of the initiative taken by both private and public hospitals. The Ministry of Health, Malaysia under 1Care system will integrate all private and government clinics to deliver better service. The system will make sure people receives premium healthcare. The program enables patients to choose where they wish to be treated. A blueprint will be developed in charting a better healthcare service. There are about 4,000 private clinics and 800 government clinics operating across the country.

Photo Credit: Holger Dieterich

viewpoints



The opportunity of Telemedicine is too significant to ignore.

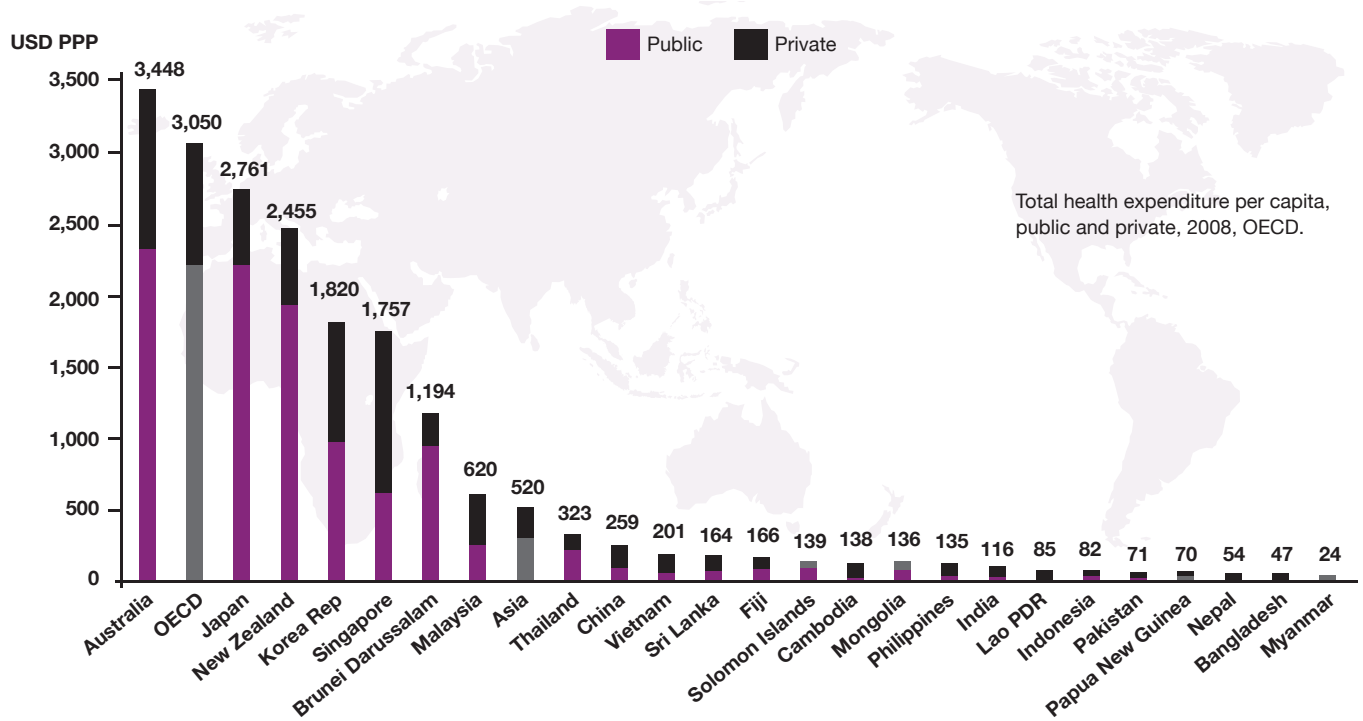
Global healthcare is now shifting from a disease-centric to a prevention-centric medical model. Self-care, self-reliance, personalization, back-to-basics fitness and active & health enhancement lifestyles trends put consumers back in control of their own health and wellness.

Innovation in parallel will come faster. A traditional healthcare system will be replaced by modern healthcare system with information technology applications. The aims are to minimize the physical movements of patients and enhances the coverage of healthcare services. Some experts believe that health IT would save money and significantly improve health care quality. Future innovations in healthcare technologies will take place to enhance healthcare quality.

In order to provide quality and affordable healthcare to all, telemedicine is going to be an important component of the modern healthcare system. It will better facilitate the existing healthcare system currently facing a number of problems such as the shortage of qualified medical professionals, high cost and limited reach in remote areas in the country. Telemedicine, being a component of ICT based healthcare, is a provision of healthcare services that uses telecommunication technology and multimedia equipment to provide healthcare solutions over the geographic distance.

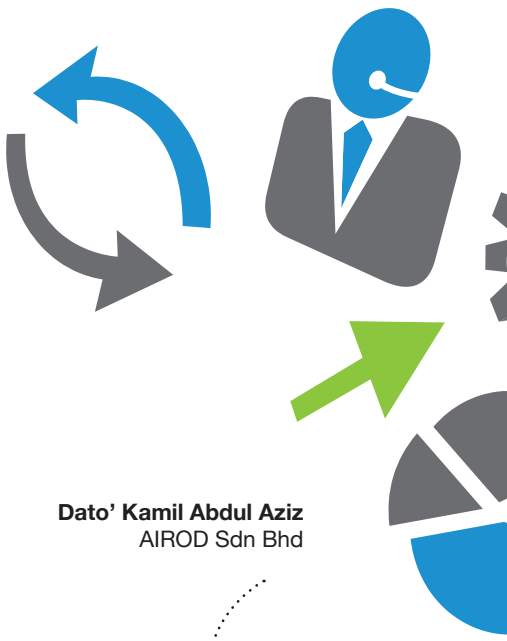
Telemedicine is poised for growth with the focus on quality healthcare for everyone. With the thrust behind improvement in healthcare delivery, the opportunity in telemedicine market is too significant to ignore. The global telemedicine market has grown rapidly during the last five years thanks to an increase in global healthcare expenditure. The market is expected to continue growing in the coming years as a result of the growing world population, the rise in life expectancy, increasing per capita GDP, increase use of web & wireless services, integration of patient alert devices & vital signs recording devices and increasing health expenditure in the emerging economies.

A traditional healthcare system will be replaced by modern healthcare system with information technology applications.

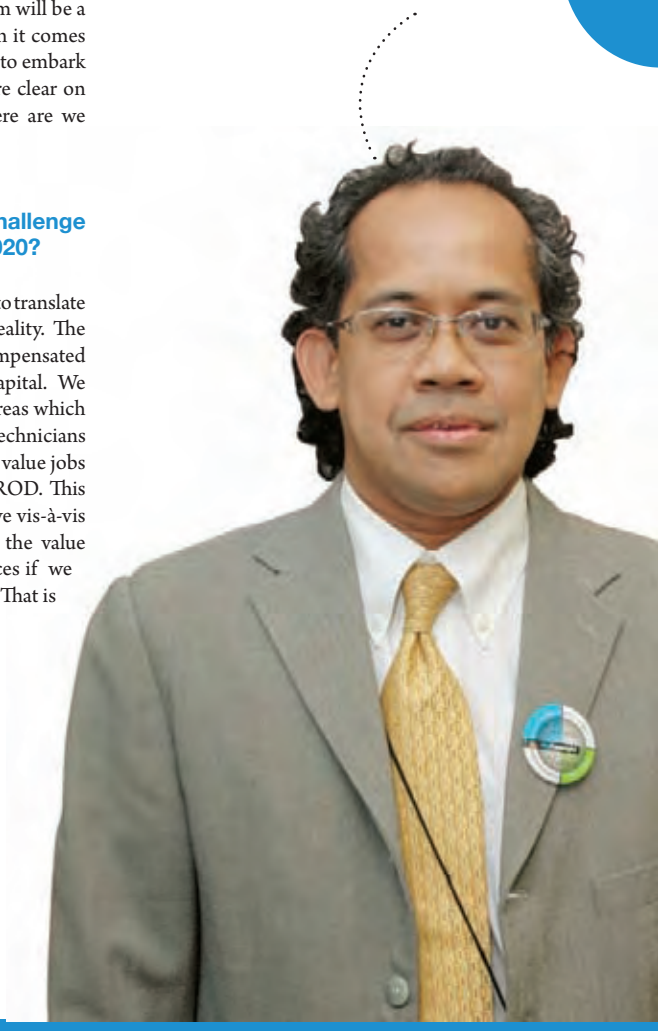


Total health expenditure per capita, public and private, 2008, OECD.

Q&A with...
Dato' Kamil Abdul Aziz and Darrell Mann



Dato' Kamil Abdul Aziz
AIROD Sdn Bhd



Do you think Foresight as a new discipline in Malaysia would help us achieve our national agenda?

I think foresight will not only benefit us but is also essential for Malaysia to move forward in line with the aspiration to be a developed Malaysia by 2020. The nation has no choice but to look into a program like 'Foresight' to make sure Malaysia achieves Vision 2020.

What do you think about myForesight™ which a division under MIGHT is now pursuing?

It's moving in the right direction. I think most of the organizations in the country or even Malaysia as a whole need to spend more time looking at where we are going, so that we can map out an effective program for the future. Sometimes, we get caught up in the day to day routine, running businesses or running the country and engaging in politics, so much so that we fail to effectively plan for the future of the nation. We often forget that we have this ultimate responsibility to see that Malaysia moves forward and survives into the next era.

You have gone through a ½ day training on foresight, what do you think of the training?

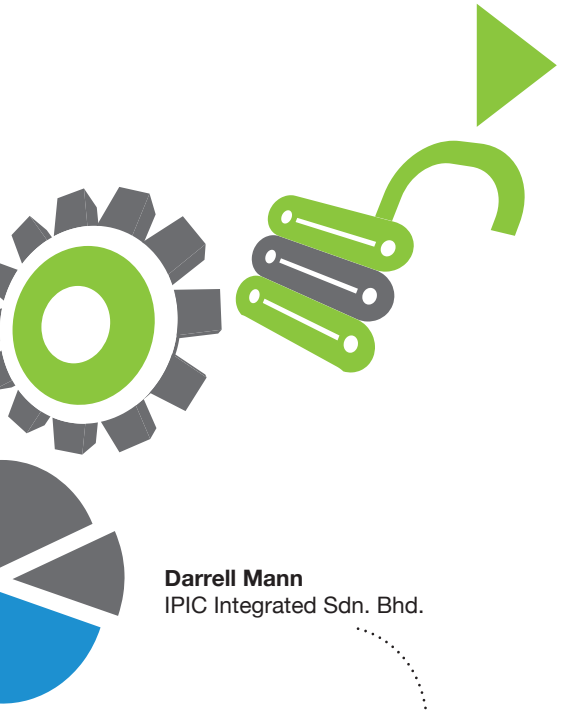
The half day training was great. I think, Darrell's experience looking at the innovation perspective is amazing. He brings along with him a wealth of experience of programs that he has done with other companies as well. The key message is that, whatever problems we face today, we are not alone. There are other companies or countries having similar problems. The secret is to tap and share knowledge and information with others so that we're not reinventing the wheel; but finding solutions to problems that other people have faced.

Do you think there is a way for you to adopt a similar methodology or discipline in achieving your target?

Definitely, in line with the many blueprints that the Nation has produced, be they the Economic Transformation Program or the Defense Industry Blueprint; I think there is a need to make sure that blueprint would work. I think the problem will be a lot more complicated subsequently when it comes to implementation. AIROD would need to embark on a similar program to make sure we are clear on our plans on the future, especially where are we heading.

What do you think is the biggest challenge for Malaysia, moving towards 2020?

The biggest challenge we have right now is to translate our high income economy plans into reality. The skilled workers will have to be properly compensated to more ref ect their high value human capital. We also need to venture into new business areas which offer higher value. We can't afford to pay technicians high wages if we are just dealing with low value jobs like simple maintenance as we do in AIROD. This would not help make us more competitive vis-à-vis others. We definitely need to move up the value chain. We need to offer high value services if we are to become high value income nation. That is what AIROD aspires to achieve.



Darrell Mann
IPIC Integrated Sdn. Bhd.

As an expert on foresight, how extensive do you think Malaysia should adopt these Foresight methodologies or processes in support of our National agenda?

Foresighting is one strategic planning tool that many countries still struggle to implement. Effectively planning for the future is critical for the well-being of every nation. The smaller the country; the more important the activity. This is due to the fact that for a small country, it is virtually impossible to invest in every single industry. It is different for a big country like China. With 1.4 billion people, China will not have much problem participating in all kinds of industry.

However, for Malaysia, with 22 million people, it is difficult. We have to be clear on which industry to invest in. As an example, in the UK at the moment, or even for more extreme places like Ireland or Finland, in population size, it is critical to plan the economic route. Through Foresighting, the question will be answered sensibly. And for Malaysia, 22 million to 25 million of population, Foresighting become crucial, as we can't be in every industry.

A number of countries, as you said, have carried out Foresighting activities. How do we measure the success rate of their activities?

We've built an Innovation Dashboard, which CEO's of big corporations use and the use within government has also increased. There are number of matrices which define the success rate. Then, we calibrate that against successful countries like Finland and Singapore. The matrices are all about the step changes and how well countries and companies can understand the map of those step changes.

The matrices will indicate a certain degrees of certainty, and will build confidence level. For example, it can be 90% certain that some prediction is going to happen, or it can be less.

In your opinion, which countries you feel have benefited the most from foresighting, and which one can be the model country on Foresight activities?

Personally, I don't think many countries have been doing particularly well. However, Singapore historically has a good record in terms of understanding how to change things in society. Singapore is a very small nation, where they have a small people. They are really making a jump into knowledge economy and does a lot of things that we used to do. I still find it difficult as a developing country. Singapore would be a very good example.

However, I think Multinational Corporations do Foresighting far better than countries. Statistically, over 50 out of 100 leading economies of the world are companies. Now, some companies are in fact bigger than countries and they benefit from Foresight. Some of the companies that we worked with include P&G and others. I think they provide a much better model of Foresighting success than countries.

Are you aware of myForesight™ and what do you think of our work so far? Do you think we are on the right track?

It still early days, but I think it is a good an initiative. You have taken the right first steps. There is no equivalent in the UK or in Ireland. However, I think what myForesightTM does is that it gives people visibility to a question. The answer is still be a long way, but most important is that it creates awareness of that particular question. It is great that you have made that initial step.

In Malaysia, we are aware that companies like Shell Malaysia and Petronas have been using Foresight in charting their future directions and moving forward?

We have worked with Shell as an organisation back in the year 2000, mainly looking at their long term future. We are about 40 to 50 years ahead. We have done some foresighting with Petronas as well. This has been mainly concerned with innovation and invention; looking at the jumps they have to make inside their organisation if they are to remain viable.

Any last words for myForesight™?

Keep up the good work. You have made a great start. I think it will be more impactful if you can publicise the output to make it more visible to the people in companies and in government. Thank you.

The Stakeholders Contribution


NATIONAL
FORESIGHT
PROGRAMME


SMI
MALAYSIA
NEF


SOCIO-POLITIC


THB RESEARCH
BT
Scomi
SILTERRA


GROUP 5


TeAM
MPC
STANDARDS

myForesight™
BOOK CLUB

What Technology Wants

Author: Kevin Kelly
Length: 416 pages
Publisher: Viking, New York
ISBN-10: 0670022152
ISBN-13: 978-0670022151

This provocative book introduces a brand-new view of technology. It suggests that technology as a whole is not just a jumble of wires and metal but a living, evolving organism that has its own unconscious needs and tendencies. Kelly looks out through the eyes of this global technological system to discover "what it wants." Kelly uses vivid examples from the past to trace technology's long course, and then follows a dozen trajectories of technology into the near future to project where technology is headed.

This new theory of technology offers three practical lessons: By listening to what technology wants we can better prepare ourselves and our children for the inevitable technologies to come. By adopting the principles of pro-action and engagement, we can steer technologies into their best roles. And by aligning ourselves with the long-term imperatives of this near-living system, we can capture its full gifts.

World Wide Mind: The Coming Integration of Humanity, Machines, and the Internet

Author: Michael Chorost
Length: 240 pages
Publisher: Simon and Schuster
ISBN-10: 1439119147
ISBN-13: 978-1439119143

What if digital communication felt as real as being touched?

This question led Michael Chorost to explore profound new ideas triggered by lab research around the world. Marvelous and momentous, World Wide Mind takes mind-to-mind communication out of the realm of science fiction and reveals how we are on the verge of a radical new understanding of human interaction.

With daring and sensitivity, Chorost writes about how he learned how to enhance his relationships by attending workshops teaching the power of touch. He learned how to bring technology and communication together to find true love, and his story shows how we can master technology to make ourselves more human rather than less.

World Wide Mind offers a new understanding of how we communicate, what we need to connect fully with one another, and how our addiction to email and texting can be countered with technologies that put us – literally – in each other's minds.

Technology's Promise

Author: William Halal
Length: 256 pages
Publisher: Palgrave Macmillan
ISBN-10: 0230019544

Technology's Promise: Expert Knowledge on the Transformation of Business and Society brilliantly deals with the co-evolution of technology, business and society. It is a concise but complete "history of the future," covering most scientific and technological fields, with specific scenarios until 2050 and with general ideas for the future of humanity.

This truly fascinating book by William Halal is a summary of his current research aided by an expert panel of about 100 futurists around the world. Halal was educated as an aerospace engineer who served as an Air Force officer, worked on the Apollo Program and in Silicon Valley, and has always been following science and technology and its impact on the "real world."

Halal begins his book with an excellent guide to the present technological revolution, followed by specific chapters about the most important technologies and their direct impacts on business and society. He then carefully reviews most of the major areas covered in the TechCast Project: energy and environment, information technology. E-commerce, manufacturing and robotics, medicine and biogenetics, transportation and space:

Maritime Technical Center

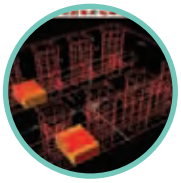
- *Group of Companies All Under One Roof*
- *Naval Architecture and Marine Engineering Services*

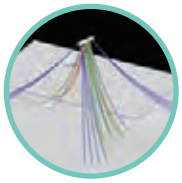
Maritime Technical Center Sdn. Bhd. (MTC) specialises in front end engineering design (FEED) and detailed engineering for naval architecture and marine engineering. Made up of local naval architects and marine engineers with global exposure whom have developed proven floating solutions – FPSO, FSO, DLB, Drilling Barge, tankers and dredgers. The engineering services that the company offers is from turnkey projects to specific analysis. The services rendered previously includes manual, mooring analysis, testing procedures and engineering analysis.

MTC is currently expanding into engineering consultancy under MTC Engineering Sdn. Bhd. (843778-T), registered with BEM and MOF for Naval Architecture and Marine Engineering Services. MTC Engineering participates in the floating solutions mainly for deepwater engineering and is moving up into the niche engineering sector by collaborating with Principia SAS. The collaboration delivers expertise and ground-breaking engineering design services applied to floating facilities, subsea modules, umbilicals, risers and flowlines, fixed platforms, offshore service vessels, and LNG terminals.

MTC, MTC Engineering and combined alliance with Principia Group has offices in La Ciotat, Paris, Houston, Singapore and Kuala Lumpur . The group of companies have the ability to provide a full suite of engineering, project management, interface management and client support for various marine and floating structures.

The area of expertise encompasses design, analysis and installation support for multi facets of floating and fixed offshore structures and their components from seabed to surface incorporating the experience and technology of engineering team.





The Group offers services for the following range of marine facilities:

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- Mooring Launch
- Fishing vessels
- Tugs and barges
- Accommodation Barge
- Arrangement and specialized study

MOORING SYSTEMS

- Catenaries anchor leg
- Taut and semi-taut systems
- Chain, wire and synthetic mooring lines
- Drag embedment, suction and pile anchors

RISER SYSTEMS

- Flexible risers & umbilicals
- Steel catenary risers
- Direct vertical access risers
- Hybrid riser systems

FLOATING PRODUCTION AND/OR STORAGE SYSTEMS

- Ship-shaped
- Semi-submersibles

FIXED PLATFORMS

- Load out
- Transportation
- Installation and float-over

SERVICES OFFERED BY THE GROUP

- Naval Architecture & Hydrodynamics
- Structural & Mechanical Engineering
- Mooring & Riser Engineering
- Marine Engineering & Inspection Services
- Consulting and project services to the Energy Industry
- Engineering Design – Analysis – Field Support
- Projects from concept to commissioning
- Cost estimating (CAPEX / OPEX)

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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.

Or maybe, you would like to contribute articles to the myForesight™ magazine? Send your feedback and articles to foresightinternal@might.org.my.

We look forward to hearing from you.

myForesight™ team