

AN INTEGRATED CURRICULUM IN MALAYSIAN UNIVERSITIES: A CONCEPTUAL STUDY

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ABSTRACT

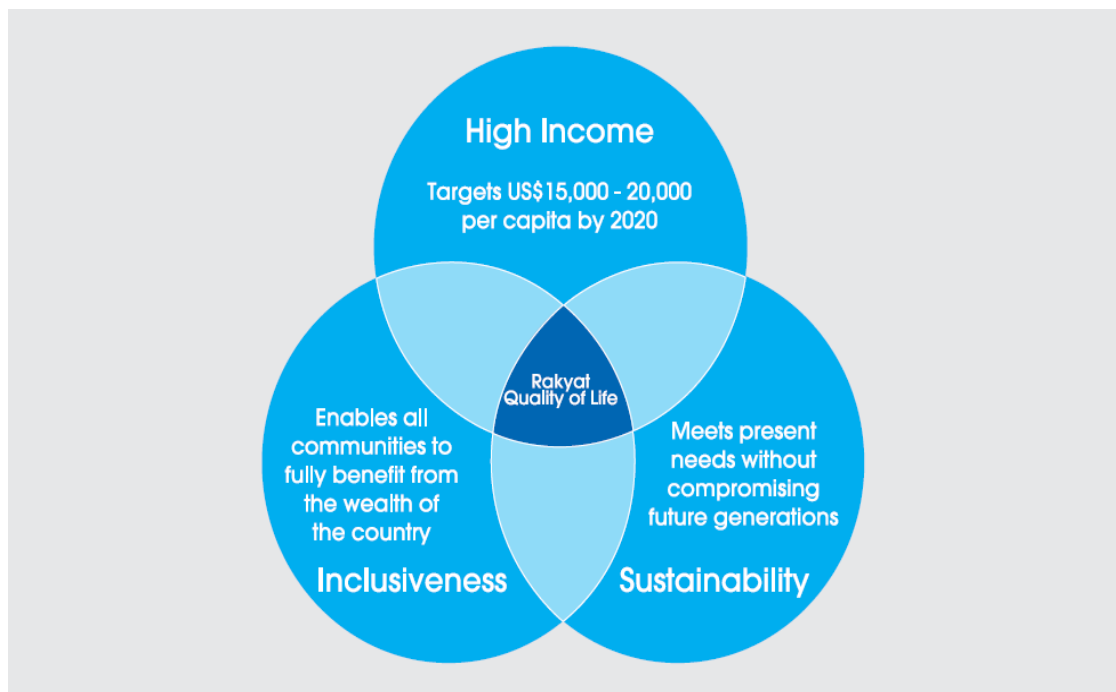
In the year 1991, Malaysia has come out with the Vision 2020. Three main goals of this agenda are a high income economy, inclusiveness and sustainability. To assist in achieving these objectives, the Ministry of Higher Education has come out with The Malaysian Education Blueprint 2015-2025 (MEB) for Higher Education. This blue-print comes along the Eleventh Malaysia Plan. Both Plans chart the direction for Malaysia to achieve the Vision 2020. In 2015, higher education enrolment has increased by 70% to 1.2 million students over the last 10 years. The growth rate of research output and quality has been one of the highest in the world, and Malaysian institutions are ranked strongly among the Asian peers. Seeing this trend, Malaysia must adapt itself to the competitive global economic environment. This includes the transformation of Malaysia's higher education system. The job scenario of tomorrow will require greater emphasis on science, technology, engineering and mathematics. The commercialization of ideas and industry research partnerships are expected to propel innovation. In addition to the above, a sustainable funding model with clear outcomes, incentives, and support for those who is need is most critical and crucial. Henceforth, this blueprint will transform Malaysia's higher education system to meet these new challenges. Therefore, universities cannot anymore stand alone. So the curriculum put forth by Universities must be relevant and meeting the needs of the stakeholders. That is why the private sector will be encouraged to provide faculty and design curriculum that are tightly linked to required job skills, to co-fund research, and have off-take agreements for graduates. This is to ensure sustainability of universities in years to come. To make this happen universities cannot work in silo, they have to reciprocate by being innovative and relevant. It calls for curriculum at the universities to be integrated with various disciplines. This leads to the importance of combining technical and management skills. Graduates possessing both competencies are able to meet the demands of the work force in Malaysia. There is also a

need to focus on green growth and sustainable development issues where universities become the agent of change that promote development which is ecologically, socially and economically sustainable. The paper discusses two multi-disciplinary programs that focus both on sustainable development and business engineering. Of late, these two sectors have grown in importance internationally and in the local arena. In all cases, the change in the education agenda has been brought about by the movement that believes that a change has to be made. Industrial players, the government and professionals have been seen to play an important role in realising this agenda. For example, although business engineering is technical in nature but courses in the areas of soft skills and human values such as ethics, risk and governance are also offered in addition to engineering courses. By nature they complement the hard skills and in a long run will ensure the sustainability of the projects and also to preserve sustainability of economy while at the same time preserving the environment and society.

INTRODUCTION

In 1991, Malaysia had committed itself to the Vision 2020. The vision states by year 2020 “Malaysia is to be a fully developed country, with a confident society, infused with strong moral and ethical values, living in a society that is democratic, liberal and tolerant, caring, economically just and equitable, progressive and prosperous and in full possession of an economy that is competitive, dynamic, robust and resilient.” To achieve the Vision 2020, the government has embarked amongst others; the New Economic Model (NEM) which is to be achieved through an Economic Transformation Programme (ETP). As shown in Figure 1 the government hopes to achieve three goals under NEM, namely; (i) for the country to be a high income economy with a GNI per capita income between US\$15,000 to US\$20,000 by 2020; (ii) to practice inclusiveness, which enables all communities to fully benefit from the wealth of the country and (iii) to ensure sustainability where present needs are met without compromising future generations.

Figure 1: New Economic Model



Source: National Economic Advisory Council. 2009. New Economic Model for Malaysia

To complement the Economic Transformation Program, in the year 2013, the Ministry of Higher Education has developed the Malaysian Education Blueprint (MEB) 2015-2025. The blueprint aims to equip Malaysia towards becoming a high-income nation through the process of education. It is hoped that by 2025, the Ministry aspires to increase the access and enrolment in higher education. Through the MEB, students will enjoy higher quality programs that use experiential and technology-enabled learning models to offer more personalised and engaging learning experiences that push the limit of their potentials. On the other hand, industry will be able to secure learned, values-driven talent who are better prepared for work with the right knowledge, skills, behaviours, attitudes, and mind-sets that industry needs. To ensure both ends are met, leaders of higher institutions of learning will be empowered with greater decision-making rights in their respective public institutions to devolve themselves when they are ready, in order to enhance their agility in responding to local and global-trends.

With the success of the above, it is targeted that education enrolment would increase from 48% to 70%. The growth scenario will see an additional 1.1 million places to be provided by the year 2025. This aspiration is geared towards the growth in technical and vocational education and training (TVET) coupled with private Higher Learning Institutions and online learning. The exact

phase and nature of the expansion plan will be determined by the close collaboration with the industrial partners while at the same time adhering to factors of supply matches demand. Thus the ministry wishes to construct a system that is less focused on the traditional academic pathways and to place an equal importance on the much-needed value technical and vocational training. It wishes also to instil an entrepreneurial mind-set throughout Malaysia's higher education system. It is hoped that upon graduation, graduates will create jobs, rather than to only be job seekers. In conclusion we can summarise by saying MEB proposes many major reforms to Malaysia's higher education system in order to accelerate the upward mobility of the system. It places the needs and interests of the educational community in the fore-front by providing equitable access to high-quality education of international standing. It warrants for a more frequent and intensive industry and community engagement, collaboration, and partnership. It strives for greater excellence through continuous innovation. Through this collective effort by all stakeholders the higher education system can be transformed to equip each and every individual Malaysians to face the challenges and opportunities out there in a competitive world market.

Ministry of Higher Education aspired to improve quality of graduates, quality of institutions and the overall system of quality. On the quality of graduates, the ministry hopes to increase the current 75% in graduate employability rate to more than 80% by the year 2020. On quality of institutions, currently only one of the Malaysian universities is currently in the Top 200 QS global rankings. By 2025, the Ministry aims to place one University in the Asia's Top 25, two in the Global Top 100 and four in the Global Top 200. For the quality of the overall system, the Ministry aspires to raise its U21 ranking for research output from 36th out of 50 countries to the top 25, and to increase the number of international students from 108,000 to 250,000 students in higher learning institutions. In terms of efficiency, Ministry aims to maximise the return on investment in higher education and to maintain the current levels of Government expenditure per student across public institutions. To achieve these aspirations, MEB outlines 10 shifts (please refer to Figure 2) that will spur continued excellence in the higher education system. All 10 shifts address key performance issues in the system. This in particular refers to quality and efficiency as well as global trends that are disrupting the higher education's landscape.

The first four shifts focus on outcomes for key stakeholders in the higher education system, including students in academic and TVET pathways, the academic community as well as all Malaysian participating in lifelong learning. The other six shifts focus on enablers for the higher

education ecosystem, covering critical components such as funding, governance, innovation, internationalisation, online learning and delivery.

Figure 2: The 10 Shifts



Source: Ministry of Education Malaysia. 2015. Executive Summary of Malaysia Education Blueprint 2015-2025 (Higher Education).

The eleventh Malaysia Plan, 2016-2020 is the final leg in the journey towards realising Vision 2020. It is formulated with the citizens being the centrepiece of all development efforts and it is based on 6 strategic thrust, namely, (i) enhancing inclusiveness towards equitable society, (ii) improving wellbeing for all, (iii) accelerating human capital development for an advanced nation, (iv) pursuing green growth for sustainability and resilience, (v) strengthening infrastructure to support economic expansion and (vi) re-engineering growth for greater prosperity. Strategic thrust 3 on "Pursuing Green Growth for Sustainability and Resilience" emphasises on a commitment to green growth of all Malaysian so that the precious environment and natural endowment are conserved and protected for present and future generations. Strategic thrust 6, on "Re-engineering economic growth for greater prosperity" emphasise on fostering a dynamic

environment for knowledge intensive services and increasing internationalisation of service firms (11th Malaysia Plan, 2016-2020).

The emphasis of both MEB and 11th Malaysia Plan will then be cascaded down to the Universities and thus will become part of KPI of the lecturers. In summary, it can be said that to remain competitive in education, Malaysia needs to produce curriculum that is attractive and practical meaning to say courses need to be integrated with various other disciplines. Both technical and management skills have been given prominence. Malaysia placed importance to vocational and technical students (TVET education) in MEB. To be sustainable and a wholesome graduate, he or she needs to be well equipped not only with the technical skills but also business, human and social knowledge. Having included both technical and business and human knowledge alone is not sufficient. It needs also to be embedded with practical problem solving skills of the industry. Thus support from professional bodies, businesses and industry is a key element for it to be successful. Here, the industry will be asked to step forward as active partners in the transformation journey, contributing across the entire education and innovation value chain, from curriculum design and funding and placement for graduates as well as research, development and commercialization.

This paper aims to discuss some of the integrated curriculum undertaken by some universities. Sustainable Development and Business Engineering program are discussed in this paper. The major objectives of sustainable development refers to the mainstream principles of sustainability into teaching, research and community missions; promote teaching and training which will produce graduates who can think and act with holistic understanding of economy, while Business Engineering programme places strong emphasis on the unique combination between Business and Engineering knowledge. This programme assimilates the knowledge of Business and Engineering allowing graduates to gain competitive edge in technically oriented business positions, especially in the area of logistics, supply chain and production environment and society and build human resource and technical capacity for research to produce innovative products or ideas to address real world sustainability issues.

When aligning the issues of sustainability and business engineering enables to address human and environmental issues such as; population and poverty, production and consumption. Eradicating poverty in all its form is an indispensable requirement for sustainable development. National poverty reduction strategies, equal rights for women, empowering indigenous people,

providing basic health services, increased access to water and affordable energy, significant improvements in the life of the urban poor through education and skills development and providing credit and access to resources are key to poverty alleviation. Rapid population growth aggravates poverty in developing countries by producing high ratio of dependent children for each working adults. This leads to a relatively high percentage of income spent on immediate survival needs, leaving little money for purchase of elective goods or for investment in the economy, education, government services or infrastructure. Lack of capital available capital continues to frustrate the attempts of developing countries to expand and their economies and reduce poverty. With business engineering and sustainable development knowledge problems stated above could be better managed. Based on this premise too, it will also to be able to address the production and consumption obstacle. Consumption and overproduction are usually associated with population growth, lifestyles of the wealthy and the changes in the consumption patterns of rapidly growing middle class. Food, shelter, transportation, clothing and recreation are the main areas where individuals consume goods and services. Knowledge of environmentally and socially superior products and knowledge of appropriate and disposal are essential to improving our performance in this area.

Among the production challenges to be addressed urgently are corporate social and environmental responsibility, cleaner technology, eco-design, eco-efficiency, life-cycle analysis and technology transfer that will contribute to the improvement of material and energy efficiency and minimization of waste. The social environmental and economic impact of consumption is defined by the ways in which goods and services are produced, used and disposed. Understanding the interconnectedness of business engineering and sustainable development will ease the problems of production, consumption and poverty is critical to promoting development that is socially responsible and environmentally sustainable.

MALAYSIA'S 3RD INDUSTRIAL MASTER PLAN (IMP3) & SERVICES

As the Malaysian economy matures and the nation moves towards becoming a developed nation and a high income economy, the services sector begins to assume a greater role. This can be seen in Table 1. The Industrial Malaysia Plan 3 which sees the services sector assuming the lead role in driving the economic growth from 2006-2020 as compared to the manufacturing sector. All sectors, except services, are to see a decline in their contribution to total GDP by 2020.

GDP Contribution by Sector (%)

Sector	IMP2 Target	IMP2 Actual			IMP3 Target
	2005	1996	2000	2005	2020
Manufacturing	38.4	29.1	31.9	31.4	28.5
Services	48.4	50.7	53.9	58.1	66.5
Non-Government services	-	44.2	47.1	50.5	59.7
Government services	-	6.5	6.8	7.6	6.8
Agriculture, forestry & fishery	8.2	9.8	8.9	8.2	7.0
Mining & quarrying	4.2	7.7	7.3	6.7	4.4
Construction	4.7	4.7	3.3	2.7	2.5
(-) Imputed bank services charges	-	6.0	7.5	9.1	10.0
(+) Import duties	-	4.0	2.2	1.9	1.1
Real GDP	100.0	100.0	100.0	100.0	100.0

Source: Ministry of International Trade and Industry

Table 1: Growth of Service Sector

As such it only stands to reason that this sector becomes the target for investment, domestic or otherwise. There are 12 sectors classified under services and each of these sectors has their respective World Trade Organisation (WTO) classification which defines their scope. Business services are one of them. Business services include professional services and professional services which include; (i) legal, (ii) accounting, auditing & bookkeeping, (iii) taxation; (iv) architectural; (v) engineering, (vi) integrated engineering and (viii) urban planning & landscape architectural.

Professional engineering services include engineering services and advice in connection with any feasibility study, planning, survey, design, construction, commissioning, operation, maintenance and management of engineering works or projects and include any other engineering services approved by the Board. <http://myservices.miti.gov.my/web/guest/overview1>

Integrated Curriculum

Reacting to the above argument, this paper will highlight two streams of thought in development of a postgraduate curriculum. One stream is on the Sustainability Development – ensuring that programs embed three issues on economy, environment and society which give rise to programs on sustainable development and sustainability practice. The other school of thought focuses on combining technology and business which give rise to programs such as business engineering service science and engineering management.

Sustainability Development

In Malaysia, on the 17-18 December, 2008, during the United Conference in Copenhagen, the Honourable Prime Minister of Malaysia, Dato’ Seri Najib Tun Abdul Razak has agreed to reduce the emission of carbon dioxide by 40% in 2020 as compared to 2005 through usage of advanced technology and additional funding. Realizing that Malaysia should also play a greater role on sustainable development, sustainability has then been made one of the focuses of the New Economic Model.

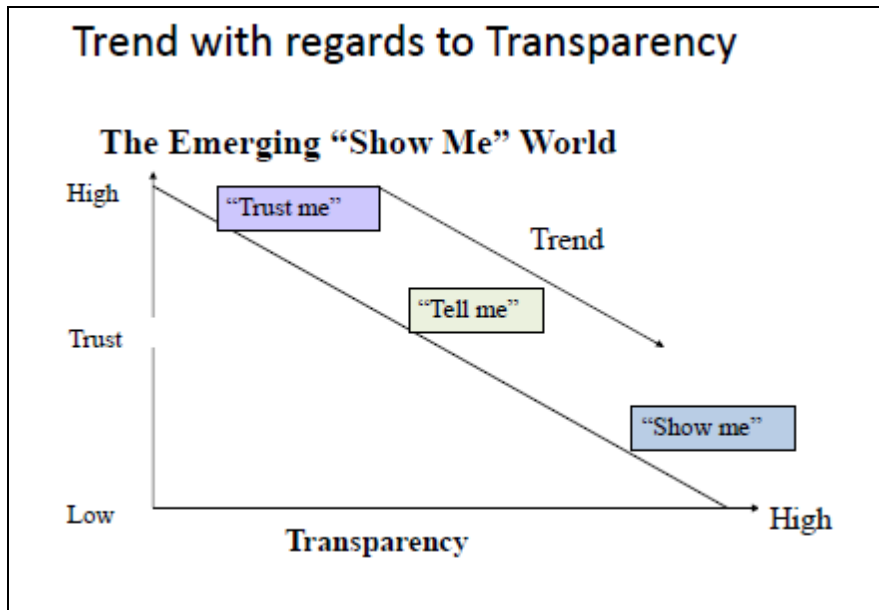
The Brundtland Commission's report defined sustainable development as *"development which meets the needs of current generations without compromising the ability of future generations to meet their own needs"*. (Brundtland Report, 1987). The concept supports strong economic and social development and emphasise the importance of protecting the environment. The report emphasises that economic and social well-being cannot be improved with measures that destroy the environment. Focus areas of sustainability is as shown in Figure 3.



Figure 3: Focus on sustainability

Business should be “accountable” or “responsible” to all stakeholders, quantified or measured impact of business decisions so that whatever “harm” has been done can be rectified. One of the ways- Annual reports of businesses should state impact of decisions to the environment. This can be seen from Figure 4 where there is more demand from stakeholders to show them the results of actions taken or impact of business decisions rather than only disclosing the efforts undertaken.

Figure 4: Trend with regards to Transparency



Source: Amran, A. Presentation at Graduate School of Business, USM, 2014.

MBA Sustainable Development and Postgraduate Courses in Sustainable Development

The network for the Promotion of Sustainability in Postgraduate Education and Research (ProSPER.Net) is a network of several leading higher education institutions in Asia and the Pacific that have committed to work together to integrate Sustainable Development (SD) into postgraduate courses and curricula. Member institutions involved have strong education and research programmes in sustainable development and related fields.

The ProSPER.Net academic and research alliance is an effort of the ESD Programme at UNU-IAS to bring about understanding and delivery of ESD and SD at the postgraduate level. Two universities are members of ProSPER.Net include Universiti Sains Malaysia and Malaysian Institute of Technology.

As a result, courses like governance and corporate social responsibility and business issues and sustainability has been made a core course in some MBA programs or embedded as a topic in a course and also in masters in development practice.

Introduced in 2009, the MBA SD in USM offers specialization courses in sustainability concept and issues, ecological science and environmental management, green business and performance assessment and CSR and Social Enterprise. Please refer to Figure 5.

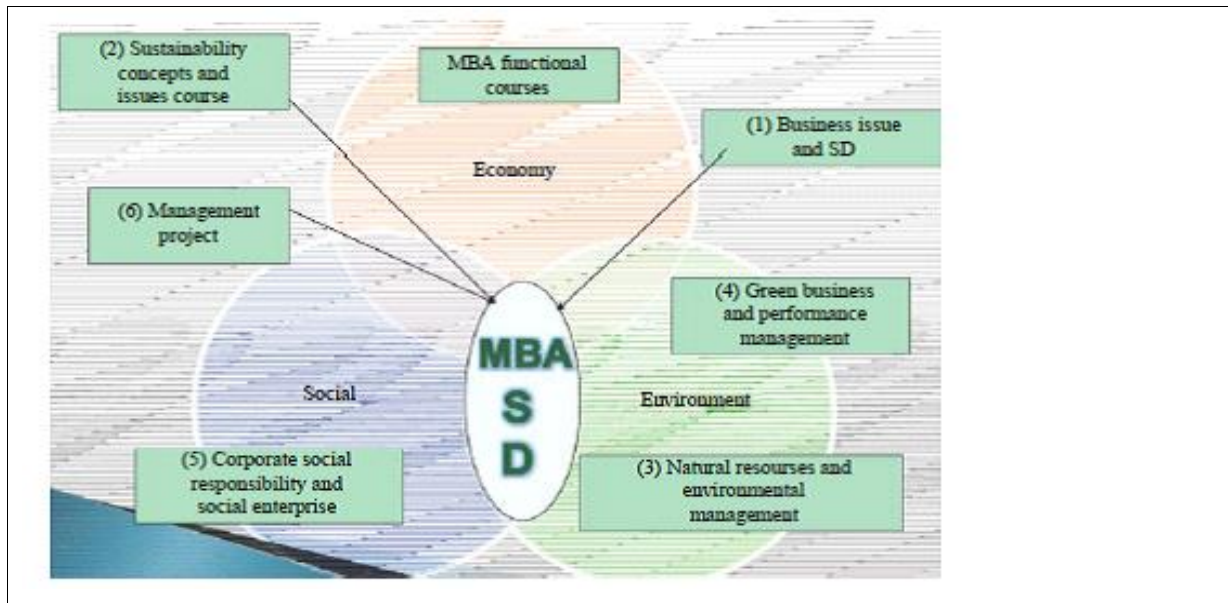


Figure 5: Structure of the MBA programme

Source: Amran, A., Abdul Khalid, S.N. Abdul Razak, D and Haron, H.(2010).

Masters in Sustainable Development Practice

As a result of the International Commission on Education for Sustainable Development Practice 2008 Report. The commission member included 20 eminent scholars and practitioners from a variety of disciplines and was co-chaired by Professor Jeffrey Sachs who is the director of the Earth Institute and Special Advisor to the current United Nations Secretary General Ban Ki-Moon on the Millennium Development Goals. He also held the same position under former UN Secretary General Kofi Annan. The commission was tasked to identify practical initiatives to support and emerging field of cross-disciplinary "sustainable development practice". The commission's report proposed a set of recommendations for a new and unique educational system focused on sustainable development practice which would be offered through the Master's in Sustainable Development Practice (MDP) programme.

MDP hopes to produce graduates that could help solve the objectives of the Millennium Development Goals (MDGs) which aims to: (i) Eradicate extreme poverty and hunger; (ii) Achieve universal primary education; (iii) Promote gender equality and empower women; (iv) Reduce child mortality; (v) Improve maternal health; (vi) Combat HIV/AIDS, malaria and other diseases; (vii) Ensure environmental sustainability and (viii) Develop a global partnership for development. Master's in Development Practice (MDP) Program; which is an international, interdisciplinary program that aims to address the eight MDGs. It prepares students to better identify and address the challenges of sustainable development with regard to contemporary real-world

issues. The program will also place a strong emphasis on “hands on” fieldwork to enable students to put to practice the theories learned in the classroom. A unique feature of the program is the global classroom course which enables students and faculty members from participating universities around the world to share their local knowledge and experiences and to jointly explore the key challenges of sustainable development via video-conferencing technology.

This program traverses four major disciplines – health sciences, natural sciences, social sciences and management sciences – all of which equip development practitioners with the ability to “speak” the different “languages” of specialists, for instance in health, agronomy or economics, thus enabling them to better understand the root causes of extreme poverty and to address the challenges of sustainable development.

This programme is different from MBA Sustainable Development as it has a combination of courses in global health, social sciences, natural sciences and management. In all universities offering similar nature to the MSDP programme, would have a cross sectorial field training or internship which will require the students to work with communities, industries and government agencies and to provide workable solutions and recommendations for addressing the complex development challenges encountered in the field training or internship.

Another unique characteristic of this programme is that one of the courses (Global Classroom: Foundations of Sustainable Development Practice) is a course that fosters cross-disciplinary collaboration and allows students and teachers from around the world to participate in collective assignments and learning experiences through live video conference. Students from around the world are assigned the same readings and then join their classmates for live weekly on-camera sessions with global experts (<https://cgss.usm.my/index.php/en/academic-programmes-2/postgraduate/coursework>).

Engineering, Technology and Business

The Prime Minister of Malaysia in 2010 budget speech wanted Malaysia to move from agriculture economy to more industrial based. In his words,

“We were successful in the past in transforming the economy from agriculture to industrial-based. We now have to shift to new economic model based on innovation, creativity and high value-added activities. Only then we will be able to remain relevant in a competitive global economy”.

Third Industrial Master Plan of Malaysia sees the services sector assuming the lead role in driving economic growth from 2006-2020. Thus rather than focusing more on manufacturing there is a call for education provider to assist this sector. For example, how services can be better managed, cost and how it can be value added.

As such, there were efforts undertaken by some universities to move towards offering programs to equip graduates with competencies needed to value add to services.

Service, Science, Management and Engineering (SSME)

One such course is Service Science Management and Engineering (SSME). This term that has been promoted by IBM is the application of scientific, management, and engineering disciplines to tasks that one organization beneficially performs for and with another ('services'). The four terms of Service Science, Management and Engineering are as follows:

- Science is a way to create knowledge
- Engineering is a way to apply knowledge and create new value
- Business Model is a way to apply knowledge and capture value
- Management improves the process of creating and capturing value

As mentioned by IBM, service science management and engineering education is a broader based and interdisciplinary programme. Graduates of University need to have a more broad based knowledge or more "T – shaped" people. The vertical portion of the "T" symbolizes narrow and deep technical knowledge while the crossbar represents the broader knowledge in allied areas. Figure 6 shows a pictorial representation of what is meant by "T-shaped" people and the courses that have been suggested in an SSME program. The graduate need to have knowledge in technical, systems, technology and human.

Figure 6: T-Shaped People



Source: Presentation by IBM, Service, Science, Management and Engineering (SSME) at Universiti Sains Malaysia, 2007

Malaysia's growing services-oriented economy can benefit from a pool of employees trained to improve service innovation and quality, advancing economic and innovation agendas. These service-minded professionals and undergraduates possess deep knowledge in one discipline and broader knowledge in other areas, providing a mix of business, technical and liberal arts knowledge for the development of richer innovations.

However one should note that Business Engineering (BE) refers to the development and implementation of business solutions, from business model to business processes and organizational structure to information systems and information technology. Most of the business engineering offered across the globe includes courses in business and an emphasis on information technology courses such as business intelligence and simulation. It is an engineering of the business projects taught so that the program's main focus lies on providing practical knowledge in the areas of business strategy/business model, business processes/organizational structure, information systems/information technology, and the political and cultural dimensions of economic activity. At the end of the program, the newly received Business Engineers are qualified to actively and holistically transform their businesses and take over executive positions within their organizations.

In 2009, MBA SSME was introduced by the Graduate School of Business, Universiti Sains Malaysia. The program is a joint collaboration with IBM. Graduates are exposed to multi-disciplinary areas that are aimed at enhancing their professionalism and enabling them to lead their organizations toward success. Amongst the courses offered in the program are service management, technology management and innovation, business intelligence for business excellence and corporate citizenship for sustainable growth.

Business Engineering

The field of business engineering is developed primarily to fill the gap between the management and technical teams within a company. Many of the qualities that make individuals successful in technical fields also leave them ill-equipped to handle leadership positions, and vice versa. Management may have difficulty translating their plans to technical teams, who may in turn find it challenging to develop products and solutions to carry out these plans in the real world. Business engineering acts as a bridge between these two areas, and is designed to help a company not only develop effective goals, but also techniques for carrying out these goals as efficiently as possible. Career progression within the engineering profession typically requires engineers to become more involved in planning and coordinating with other business functions such as purchasing, quality, human resource, marketing and finance. This planning and co-ordination is vital to ensure that the engineers design and make products that meet the ever more stringent customer requirements for low cost, high quality and delivery on time. According to Engr. Charles Q. Dadua, the Moderator of Ateneo Business Engineering Techno-preno Philippines, Business Engineering is a combination of business management and engineering. Another difference between business engineering and engineering program is that there is no engineering lab work for these students. Graduates can work in Commercial, Industry and can also become an entrepreneur. (https://www.youtube.com/watch?v=vJthQW2YA_U).

Some universities that offer Master in Business Engineering offers the opportunity to students to understand and get involved in all areas of management. The programme will usually have the areas of finance, marketing, control, strategy, and human resources, but will also develop the skills that top executives and entrepreneurs require: information processing, problem solving, project leadership, people management, communication, ethical behaviour, entrepreneurship, critical mind-set and personal judgment, teamwork and self-management. (<http://www.solvay.edu/master-business-engineering>).

Some courses offered in Business Engineering can be seen in Table 2.

Table 2: Courses offered in Business Engineering Institutions

No.	Courses/ Universities D-Degree M-Masters	UNI-MA P M'sia		Edith Cowan Uni, A'trli a		USQ. A'trli a		KU Leuven Belgium		The Uni. of Newcastle A'trli a		Rosenheim Uni. Germany		Technische Hochschule Koln, Germany		TU Cluster, Germany	
		D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
MANAGEMENT																	
1.	Management		*			*		*		*		*				*	
2.	Management Consulting		*														
3.	Managerial Economics		*	*		*		*		*							*
4.	Marketing Management		*	*		*		*	*	*	*	*	*	*			*
5.	Business Communication and Analysis			*				*		*			*			*	
6.	Finance 1			*									*				
7.	Introduction to Finance							*		*			*			*	
8.	Legal Framework			*						*							
9.	Introduction to Law					*		*		*		*	*				
10.	Information Systems for Business			*				*	*	*			*			*	
11.	Marketing Engineering							*	*	*		*	*				

No.	Courses/ Universities D-Degree M-Masters	UNI- MA P M'si a		Edith Cowan Uni, A'trli a		USQ. A'trli a		KU Leu- ven Bel- gium		The Uni. of New- castle A'trli a		Rosen- heim Uni. Germ a-ny		Technisc he Hochschul e Koln, Ger- many		TU Cluster, German y	
		D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
12.	Chain Management											*					*
13.	Supply Chain Management							*	*	*			*	*			*
14.	Principles of Database Management							*	*	*		*					
15.	Introduction to Finance							*		*			*			*	
16.	Business Finance								*	*			*			*	
17.	Business Research Project		*			*		*		*							*
18.	Risk Management and Control/ Governance								*	*	*			*			
19.	Management Control and Cost Management								*	*							
20.	Quality Management								*	*		*		*			*

No.	Courses/ Universities D-Degree M-Masters	UNI- MA P M'si a		Edith Cowa n Uni, A'trli a		USQ. A'trli a		KU Leu- ven Bel- gium		The Uni. of New- castle A'trli a		Rosen- heim Uni. Germ a-ny		Technisc he Hochschul e Koln, Ger- many		TU Cluster, German y	
		D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
21.	Strategic Management								*		*		*				*
22.	Material and Manufacturing 1			*									*				
23.	Microeconomics for Business Decisions									*							*
24.	Introduction to Entrepreneurship & Innovation									*							*
25.	Project Management		*	*							*	*		*			*
QUANTITATIVE SUBJECTS																	
1.	Calculus 2										*		*				*
2.	Quantitative and Statistical Technique for Business			*				*	*								*
3.	Engineering Simulations				*				*	*		*					

No.	Courses/ Universities D-Degree M-Masters	UNI- MA P M'si a		Edith Cowa n Uni, A'trli a		USQ. A'trli a		KU Leu- ven Bel- gium		The Uni. of New- castle A'trli a		Rosen- heim Uni. Germ a-ny		Technisc he Hochschul e Koln, Ger- many		TU Cluster, German y	
		D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
	and Computations																
4.	Engineering Mathematics					*		*		*		*	*	*		*	*
5.	Calculus 1							*									
6.	Linear Algebra			*												*	
7.	Managerial Statistics							*	*								
8.	Linear optimization							*									
9.	Differential Equations			*						*							
	ENGINEERING																
1.	Emerging Engineering Technologies		*														
2.	Engineering Management		*	*		*				*	*		*	*	*		*
3.	Engineering Principles, Application and Product Design		*							*		*		*		*	*

No.	Courses/ Universities	UNI- MA P M'si a		Edith Cowa n Uni, A'trli a		USQ. A'trli a		KU Leu- ven Bel- gium		The Uni. of New- castle A'trli a		Rosen- heim Uni. Germ a-ny		Technisc he Hochschul e Koln, Ger- many		TU Cluster, German y	
		D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
14.	Professional practice 1					*								*			
15.	Professional Practice 2					*								*			
16.	Industrial Materials Engineering and Chemistry								*	*							*
17.	Energy Technology & Energy Economy								*	*							
	OTHERS																
1.	Integrated Physics									*		*		*			
2.	Advanced Physics										*		*				

From the 8 sampled universities it can be seen that majority of programmes are offered at degree (7 programmes) rather than at graduate level (6 programmes). As can be seen from the courses, there is a combination of management, quantitative method, engineering and other subjects.

In the management category, 25 courses are offered which include management, communication, strategic management, economics, finance, law, marketing, supply chain, risk management and control/governance and entrepreneurship.

In the quantitative category, 9 courses were offered which include calculus, managerial statistics and engineering mathematics.

In the Engineering category, 17 courses were offered which include engineering mechanic, electrical engineering, industrial materials engineering and chemistry, engineering innovation and ethics, software engineering and programming and energy technology. There are 2 pure science courses offered which include integrated and advanced physics.

For Faculty of Industrial Management at Universiti Malaysia Pahang, a new course on risk, governance and control will be offered. This course will include a discussion on ethics, risk and governance. The importance of these three issues is explained in the next section.

Ethics and Engineers

Decisions made by engineers usually have serious consequences to people. Ethics and ethical reasoning guide decision-making. Ethical reasoning is a type of practical reasoning that concerns certain societal or life-form goals, such as justice, equality, freedom, health and safety.

As an illustration, in terms of ethics, Engineers build products such as cell phones, home appliances and with technology that they have come out with will contribute to society's wellbeing. In another aspect, engineers also develop processes, such as the process to convert salt water into fresh water and these processes too change how society live and accomplish.

Thus, engineers would need to ensure those products and processes' consequences on society. For example if the conversion of salt water involves processes that is hazardous for public's health, then they should bring this to light.

Risk and Engineers

Risk is associated with engineering in terms of structures, products, processes and materials used in construction and operation of engineering structures. Invention and innovation introduce an extra element of risk in the lack of knowledge or ignorance about the operational performance of new products. Examples are fires caused by damage or overheating of electrical batteries into laptop computers. Thus engineers should anticipate or predict all the failure modes that can lead to an accident and also take into account operational experience and past human and design errors to avoid catastrophes from happening.

Engineers are also bound by law and by professional ethics to adopt the concepts of “informed consent” towards the public about the involved risks in their designs and projects.

Governance and Engineers

Governance is focussed on the control that is present through the hierarchy of the organisation. Engineers need to give quality advice as to the new technology or services that the company wishes to build. Advice from engineers is important for the governors of the company to enable them to assure customers, stakeholders, shareholders and the legal system that projects will meet the requirements (both those of the customers and of the business). In essence, engineering assist the governors to address the twin questions, “Are we doing the right things?” and “Are we doing those things right?” If the answers to these two questions are affirmative, then the organization is heading towards a ‘no nasty surprises’ state of operations.

Similar to a commercial business, Engineers need to also pay attention to governance which must address four aspects;

- Meeting legal requirements for health & safety, probity, and so on
- Ensuring the development, at acceptable risk, of competitive offerings for its customers
- Ensuring the offerings are to specification
- Delivering the offering to the customer to the business benefit of the enterprise.

CONCLUSION

The paper discusses that education needs to be innovative and grow in trend with the current industrial needs. Education cannot be taught in silo segregating between science and technical with the arts. Now it needs to be offered in an inter-disciplinary manner and actually solve daily issues but not just academics. But science and technology alone would propagate sustainability and the tranquillity of the environments. Issues of ethics, governance and integrity should be part of the syllabus. By including these variables business people would not only be concerned about dollars and cents but the consequence of their business decision to humanity and the environment. Professional associations, government and industry should assist in this agenda, as they realised that the problems facing the world can only be solved through graduates with multi competencies. Education should place emphasis on Sustainable Development, Engineering, Technology and Business so as to produce graduates who are equipped with the right technical and management

knowledge to assist in solving the problems faced by their profession. Engineering and Technology facilitates the process and development, but engineering and technology would not ensure the sustainability of mankind. There is a need for good value and governance. With good values it ensures good-judgement that would ensure the sustainability of the future.

This paper gives an overview about the national vision, strategy in educational program and presents current available integrated curriculum in sustainable development and business engineering. Future paper could conduct a survey of company's needs and based on the needs design a curriculum that could meet the industry's needs.

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