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The Readiness of Higher Education Institutions (HEIs) Towards Knowledge-Based Economy in Malaysia

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This paper presents the results of a study conducted to identify the contribution of higher education institutions towards the knowledge-based economy in Malaysia. The results reported in the paper are based on the data collected from annual reports of various respected organizations reading books, magazines, journals, surfing the Internet and interview. Evidence indicates that the graduates from HEIs can't meet the need of the industries in the very near future. It means that Malaysia still has a long way to match with k-economy. The results also show the increase of GDP is positively related to the supply of graduates. The results suggest that the crucial role of HEIs and R&D requires firm commitments, support and direction from the government. The study also suggests opening more universities or allowing the current universities to open more branches.

Field of Research: Economics

1. Introduction

The industrial revolution of the 19th century and the scientific revolution of the 20th century have prepared the conditions for the rise of the knowledge-based economy. It is well recognized that a well-educated, trained and skilled workforce is critical in enhancing work and economic performance and sustaining competitiveness as Malaysia transforms into a knowledge-based society (Zainol, 1999). Ramon (1997) explained that the transformation of Malaysian economy could be divided into four stages: (a) Pre-Industrial Stage, which covers the period before independence (1947) until 1966. (b) The Import-Substitution phase, which extends from 1967 until 1970. (c) The Export Oriented phase which covers the period of 1971 until 1996 and (d) The Information Age. The fourth stage in Malaysia's economy took off with the introduction of the Seventh Malaysian Plan (1996-2000) and more so under the Eight Malaysian Plan (2001-2005). The thrust of the Seventh Malaysian Plan (1996) is for effort towards shifting to a knowledge-based economy. To survive and prosper in this new environment dictate that Malaysia must have major agenda of structural adjustment. In this regard, it is important to understand the readiness of Malaysian higher educational institutions to support knowledge-based economy.

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2. Review of Literature

Economic activities associated with the production and utilization of information and knowledge has become an engine of economic growth in the developed market economies, increasingly transforming all the other dimensions of development (UNDP, 2002). Based on arguments the first prerequisite for k-economy is, it has to be an information economy (OECD, 1996). The second key feature is the importance of education and human capital development. The keys to strong performance in the k-economy are the successful generation, acquisition, diffusion and exploitation of knowledge (Canada 1997). Hence, to succeed in the k-economy human capital investment through formal and informal education, training, lifelong learning and skill enhancement must given a priority.

Equally important is the ability to generate and use knowledge-innovation-for knowledge it becomes an asset only when it is actually put to use. In this respect R&D is considered one of the most important determinants of innovation. According to Cameron (1996), domestic R&D affects the rate if innovation and the quality of knowledge that can be absorbed from others. Another main feature of the k-economy is the role of information-related industries and knowledge- intensive industries (OECD 1996, Gera and Meng 1997, Masuda 1980). Currently, knowledge is globally acknowledged as the prime driving force for economic progress. This is because advances in the Information and Communication Technology (ICT) are the key factor for the revolution of knowledge (Nadarajah, R April 2000). This information, when internalised and conceptualised, is knowledge. In addition to that, ICT provides an opportunity to increase the use of information and knowledge in our existing economic activities. However, in a k-economy, the biggest challenge does not come from the natural resources and conditions, but rather than from a shortage of qualified workers.

In moving forward to achieving a fully developed nation by the year 2020, Malaysia has to face some challenges. The Multimedia Super Corridor (MSC) was set up to assist in facing the challenges of Vision 2020 and to facilitate Malaysia's participation in the emerging networked global environment. As of 27th February 2001, a total of 457 companies have been accorded MSC status companies inclusive of higher education institutions (HEIs). The numbers are expected to increase. In order to boost the economy, the government has decided a dive into the k-economy is a must otherwise the more advanced countries will leave us behind. Since Malaysia has one of the best education among the 3rd World Country (Mahathir, 1991), the steps that the government has done to move towards the k-economy is to make sure that higher education institutions (HEIs) play their role in creating knowledge workers, particularly for the IT sector in general and MSC in particular. Government allocations have increased substantially for the development of intellectual human development, especially to infrastructure development of HEIs, as well as research and development (R&D). This is a testimony of the capability of Malaysia in moving ahead towards the knowledge-based economy. However, many of the higher education institutions (HEIs) have been subjected to severe criticism as it does not stimulate creative thinking

and knowledge, as the issue of highly skilled IT manpower scarcity and the mismatch between the supply of and demand for k-workers have caused many uncertainties to the success of the k-economy. In the Malaysian context, knowledge workers, as defined by MDC (1999), are individuals possessing any one of the following qualifications:

- A master's degree or above in any discipline
- Bachelor degree (any discipline) or Diploma in multimedia/IT from a college, plus 2 or more years of professional experience in this field. Or
- 5 or more years of professional experience in multimedia/IT.

One very prominent author Harbinson (1973) also stressed the importance of institutions of higher learning in producing knowledge workers, which will lead to economic progress and prosperity. This paper attempts to examine the preparation of HEIs towards the new era in terms of its human capital development to provide a report and policy recommendations to assist country in overcoming obstacles to the development of a knowledge-based economy. Moreover, the study also examines the relationship between country GDP and the number of graduates from HEIs. Many studies have shown that educational attainment, public spending on education and lifelong learning are correlated positively to economic growth (Barro and Sala-i Martin 1995). Todaro (1994) showed in his research that the proposition that educational expansion promoted and in some cases even determined the rate of overall GNP growth couldn't be questioned. Another research done by Denison (1962) added that impressive statistics and numerous quantitative studies of the sources of economic growth in the West were paraded out to demonstrate that it was not the growth of physical capital but rather of human capital that was the principal source of economic progress in the developed nations.

On the other hand, Wong (1973) and Noran & Ahmad (1995) concluded in their study that education is a necessary but not sufficient condition for economic growth. From the theories studied and observations made, it is postulated that the higher education institutions are not ready to support the knowledge- based economy in Malaysia as well as GDP growth is positively related to the supply of graduates. In this regard, the authors have taken an initiative to reveal findings, which will indicate whether the higher education institutions have the right capability in supporting the K-Economy and are on the right path towards Vision 2020. Furthermore, this study also indicates the ability of Malaysia to become an information rich society in general. The rest of the paper is organized as follows: the research methodology and research design for this study is presented next, followed by the discussion and findings of the study and finally conclusions are drawn.

3. Research Methodology and Research Design

The primary and secondary data have been applied to fulfil the objective of the study. The primary data has been collected from 8 universities by direct interview to the respective person who has the graduate record of the university while secondary data obtained by reading books, journals,

magazines, annual reports of various respected organizations and surfing the Internet. Two statistical techniques have been employed in our study, such as descriptive analysis and regression analysis. Often, correlation analysis is used in conjunction with regression analysis to measure how well the regression line explains the variation of the dependent variable. The most commonly use Statistical Package for the Social Sciences (SPSS) has been employed for data analyse.

4. Discussion of Findings

As noted in above, this study will focus on the supply of knowledge workers (K-Workers) from the higher education institutions (HEIs) to match the demand. The findings show that the government in general and HEIs in particular are facing a lot of challenges that are identified as like shortage of the K-Workers in supporting the K-Economy.

The Demand and Supply of HEIs' Graduates

In terms of quantity, many of the researches and even the government's publication show that the country is and will face shortages in the supply of k-workers (Nazib, 1992). HEIs as the major contributor of human resource development fall short in producing a sufficient number of k-workers, and this fall does not comply with the needs of industry for the k-workers. The percentage of the population, either with tertiary education or enrolled in institutions providing tertiary education, is not only an indicator of the quality of the labour force but also the capability of the population in utilization knowledge and information. Moreover, the percentage of population in the labour force with tertiary education is critical to drive knowledge-based economy. Table 1 shows that the percentage of population attending tertiary education in Malaysia is very low compared to the developed countries and it is at the 2nd bottom of ranking. It indicates that in terms of percentage of population enrolling in tertiary education Malaysia is far to the way of K-Economy. The following tables indicated the trends and implications of the shortages of supply of k-workers.

Table 1: Percentage of Population Enrolling in Tertiary Education in Selected Countries (2004)

Country	**Percentage of Population Enrolling in Tertiary Education**
United States	83
United Kingdom	63
Japan	52
Thailand	41
Malaysia	29
Indonesia	16

Source: World Development Indicators 2006, World Competitiveness Yearbook 2005, UNDP 2005.

According to Multimedia Development Corporation (MDC, 1999), the supply of high quality knowledge workers is perpetually the foremost concern among multinational companies and local IT firms. However, MSC status companies will need a total of approximately 36000 knowledge workers by the year 2001 (Table 2). Table 3 is also reflected the small percentage of knowledge workers in the labour force as well as the substantial increase in the projected employment of knowledge workers from 2800 in 1997 to almost 32,000 in 2001. This is suggesting a strong demand for manpower with skill and tertiary education. In terms of the availability of relevant skilled labour, Malaysia was ranked 33rd among 47 countries (IMD, 2005). Moreover, the Ministry of human Resource (1999) indicates that a third of the current work-force still lacks the minimum literacy, learning ability and skills required for a K-based economy. The dire need to increase enrolment at the tertiary level in reflected by the very low 16 percent of the population in 2004 (Table 1) with tertiary education that is critical to drive a knowledge-based economy.

Table 2: Employment by Occupation in MSC Companies, 1997-2001.

Occupations	**Actual Number**				
	1997	**1998**	**1999**	**2000**	**2001**
Technical Communication	2935	5360	8168	11084	12003
Analyst Programmers	1071	4513	5995	8290	10613
Business Area Specialists	1431	3411	5109	6647	8432
Consultants/R&D Specialists	125	799	1256	1844	2263
Multimedia Graphic Designers	141	504	746	1144	1493
CEOs, Managers, Executives	276	565	786	858	911
TOTAL	5979	15152	22060	29867	35715

Source: Valida (1999)

Table 3: Projected Employment of K-Workers and Percentage of K-Workers in Labour Force.

	1996	**1997**	**1998**	**1999**	**2000**	**2001**
Projected Employment of K-workers	-	2805	7078	11791	20334	31628
Percentage of K-workers in labour force	11.1	17.3	17.5	17.8	-	-

Source: Halimah Awang (2004)

The number of graduates from HEIs who is considered as k-workers can't meet the need of the industries in the very near future. As noted in the 8th Malaysian Plan, the number of IT-related workers was not sufficient to meet the strong demand of private and public sectors (see Table 4). This strongly suggests the potential shortages of IT manpower in the near future, especially in the higher levels category.

Table 4: Supply and Demand for IT Manpower, 2000-2005.

	Number of workers
Demand	181,600
Supply	122,910

Source: 8th Malaysian Plan

Moreover, according to the Ministry of Human Resource (1999), a study on a survey on 1,461 giant international companies from Malaysia Industrial Development Authority's (MIDA) list of approved industries showed, from 1990 to 1998, these companies required 314,955 additional workers. However, the HEIs can only supply 252,730 numbers of graduates for the year 2005. Among this graduates, 147,847 supplied from private HEIs and 104,883 supplied from public HEIs (9th Malaysian Plan). Obviously, since 1990 to 2005 there was already a huge disparity between the supply and demand of the K-Workers. So it is obviously reveals that Malaysian HEIs contribution is far behind to supports Knowledge based economy.

Research and Development in HEIs

Research and Development (R&D) is important determinants of innovation and knowledge generation and need to be given greater emphasis. Innovation is the key to success in the k-economy. The proxies generally used to represent production of new ideas and innovations are R&D expenditure and the number of patents (OECD 1996). The number of researchers, scientists and engineers is also used to represent R&D effort. There is a wide disparity between Malaysia and the leading economies in knowledge generation, acquisition and processing, which are measured by research and development (R&D) spending, R&D personnel and the number of patents filed. Table 5 shows that Malaysia has placed in the third bottom position compared to 11 other countries most of which are developed. Malaysia's ratio of R&D to GDP improved from 0.4 per cent in 1998 to 0.7 percent in 2003 that has placed the country in the fourth bottom position compared to other countries. It is a good improvement but still far behind compared to other countries most of which are developed.

R&D efforts were partly constrained by the lack of a critical mass of scientists and engineers. To enhance research activities in public HEIs, RM676.1 million was allocated from R&D total expenditure in 2005. A total of 1,631 R&D projects were undertaken under the Intensification of Research in Priority Areas (IRPA) program. This program enabled 92 and 338 students at Ph.D and masters level, respectively to obtain their degrees by research. This is very small compared to the advanced countries and of the Newly Industrialized Economies (NIEs). In an effort to encourage private sector participation in R&D activities, an allocation of RM127.1 million was approved under the IGS (8th Malaysian Plan). From the above discussion we can conclude that in terms of R&D manpower and R&D expenditures to GDP, Malaysia is lagging further behind the knowledge based economy.

Table 5: Public Sector R&D Expenditure and Number of Scientists and Engineers for Selected Countries.

Country	**R&D expenditure (% of GDP in 2003)**	**Scientists and Engineers (per million population in 1996-2002)**
Japan	3.1	5085
United States	2.6	4526
South Korea	2.6	2979
Germany	2.5	3222
Singapore	2.1	4352
United Kingdom	1.9	2691
Australia	1.6	3446
China	1.3	633
Malaysia	0.7	294
Hong Kong	0.6	1568
Maxico	0.4	259
Thailand	0.3	289

Source: World Development Indicators 2006, World Competitiveness Yearbook 2005

In order to assess Malaysia's readiness to become a knowledge-based economy, the Knowledge-based Economy Development Index (KDI) was developed. It compares Malaysia's position is 17th in 2005 relative to 21 other countries which are mainly developed, described in table 6. The KDI is derived from selected key factors required to drive a knowledge-based economy, namely, computer infrastructure, info structure, education and training as well as R&D and technology. Moreover, in terms of number of researcher, Malaysia has placed the country in the last bottom position compared to 8 other countries most of which are developed (Table 7). In terms of knowledge enablers, generation, acquisition and processing, Malaysia is lagging further behind the advanced countries as well as some Asian countries (Table 8). Assessment of some of the above key elements of the k-economy indicates that HEIs are not yet prepared towards the new era in terms of its human capital development to provide a report and policy recommendations to assist country in overcoming obstacles to the development of a knowledge-based economy. Malaysia still has a long way to go before becoming a K-economy.

Table 6: Country Position by Knowledge-based Economic Development Index and R&D and Technology, 2005.

Country	KDI (Knowledge-based Economic Development Index)	R&D and Technology
United States	1	2
Sweden	2	3
Denmark	3	7
Japan	4	1
Finland	5	4
Norway	6	11
Netherlands	7	10
Switzerland	8	5
United Kingdom	9	13
Canada	10	12
Germany	11	8
Australia	12	15
Singapore	13	6
South Korea	14	9
New Zealand	15	19
Ireland	16	14
Malaysia	17	17
China	18	18
Thailand	19	20
Philippines	20	16
Indonesia	21	21
India	22	22

Source: EPU 2006

Table 7: Number of Researchers per 10,000 Populations.

Country	Year	Number of Researcher
Japan	1993	43
Germany	1991	31
Sweden	1991	30
Taiwan	1993	26
France	1992	24
UK	1992	23
Korea	1993	22
Singapore	1992	38
Malaysia	1994	2.3
	1996	2.0
	1998	2.8

Source: 9th Malaysian Plan

Table 8: Benchmark Indicators of Malaysia's Knowledge Position compared with Leading Economies1

Benchmark Indicators	**Malaysia**	**Leading Develop Economies[1]**	**Leading Asian Economies[1]**
Computers per 1,000 population, 2004	197	USA 749	Singapore 763
Internet users per 1,000 population, 2003	42.9	Japan 1015.7	South Korea 797.6
R&D personnel, FTE per 1,000 population, 2001	0.4	Japan 7.1	Taiwan 4.8
Patents in force per 100,000 population, 2000	1.7	Japan 820	Singapore 549

[1] Comparison is made with the best performing economy in the respective areas.

Source: Malaysian Communications & Multimedia Commission, World Development Indicators 2006, World Competitiveness Yearbook 2005, ITU 2005,

Impact Of Supply Of Graduates On Economic Growth

With regards to researchers who believe that education and economic growth is highly correlated, it can be summed that an education and skilled labour forces is a necessary condition of sustained economic growth that cannot be denied. Now, the role of HEIs are more accustomed to inspiring and enabling individuals to develop their capabilities to the highest levels, increasing knowledge and understanding, serving the needs of the economy and shaping a democratic and civilized society by producing quality manpower. Due to above illustration this study would like to examine the correlation between GDP and the supply of graduates. Table 9 shows the supply of graduates from eight public universities (UM, USM, UKM, UPM, UTM, UIA, UUM and UNIMAS) that has been collected by direct interview to the respective person who has the graduate record of the university and Malaysia's GDP.

Table 9: Supply of graduates from public higher education institutions and GDP

Year	Total Number of graduates[a]	GDP (RM in million)[b]
1995	18330	166625
1996	19381	183292
1997	20520	140684
1998	26484	182331
1999	28229	192794
2000	31046	209365
2001	34655	210480

Source: [a] Field survey, [b] Various Economic Reports

The results to fitting regression model are presented in Table 10. From the table it can be concluded that the estimated result is excellent as it fulfils the criteria of good results such as estimated coefficients is statistically significant at 0.01 level and adjusted R^2 value explains 66 percent of the variation in the change of GDP can be explained by the variability in the supply of HEIs. From the estimated equation, it can be noted that the supply of graduates has been found to bear positive sign with statistical level 0.05. It indicates that by holding other factor constant, the Malaysian GDP increased with the increases of the supply of graduates. It also indicates that the increase of 1 unit output in HEIs, the GDP will increase by 3.170 million.

Table 10: Results of the regression analysis

Variable	Estimated coefficient (β)	" t "	Sig	Std. Error
Constant	102753.1	3.859	0.012	26629.138
Supply of graduates	3.170	3.116	0.026	1.017
R^2	0.660			

The estimated equation placed in below for more clarification.

$GDP = 102753.1 + 3.170SG^c$

[c] Total number of graduates that supply from above mentioned eight public universities.

From the theories studied and observations made, it is postulated that the higher education institutions are not ready to support the knowledge- based economy in Malaysia as well as GDP growth is positively related to the supply of graduates.

5. Conclusions

Malaysia is still deficient in many of the prerequisite for the k-economy. Until this problem is overcome Malaysia will not be able to shift successfully into k-economy. Knowledge base economy will need a much higher participation rate in higher education than Malaysia are currently producing. Among the challenges that Malaysia has to address are: Certainly there is a need to increase enrolment in tertiary education especially in science and technical field because of the growing demand for new inventions and innovative products. Besides this, government needs to increase R&D expenditures to GDP to enhance research activities in HEIs. Moreover, collaboration between the HEI and the industry is very important in producing the right workforce. Self-evaluation is necessary for the HEIs in order to produce the right workforce. The industry can assist the HEIs by allocate a standard amount of fund to flourish research activities in HEIs. In this regard, two important issues will have to be addressed by HEIs. These are determining the suitable mix both in terms of the level of qualification and area of specialization and ensuring that quality education and training is delivered at level of programs. Second is the HEIs must change in order to meet the new requirements and the new challenges from the industry and society. People must be regarded as the most important resources in society.

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