



The Race towards a Knowledge Based Economy A Comparative Study between Malaysia and Thailand

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Abstract

This paper has attempted to study the development and growth of a knowledge based economy in two developing countries, namely Malaysia and Thailand. A summary of different economic theories states that the best theoretical grounding for a knowledge based economy is the endogenous growth theory. The conceptual framework established for statistically measuring the success of knowledge-based economy comprise of the following variables: 1). innovation, 2). information and communication technology, 3). human resource development and 4). business environment. Recommended additions to the framework were proposed in this paper based on integrating the following variables: 1). government incentives, 2). better human capital, and 3). institutional factors. The last section of the paper proposes policy recommendations and conclusions.

Keywords: Knowledge-Based Economy, KBE, Malaysia, Thailand

1. Introduction

A summary of the different theories of development is important in understanding the theoretical base for development policies of developing countries. However in trying to understand the shift towards a knowledge-based economy (KBE), the theory that offers the best theoretical grounding for that is the endogenous growth theory (EGT) (Abdulai, 2004).

The EGT argues that education and research and development (R&D) are important factors in sustaining a long-run economic growth rate. This is evident from policy reports that show that lack of education is a major cause for the slower growth in OECD countries when compared to the United States (Sapir and Hue, 2004). Much like other theories can help predict and understand phenomena, the EGT can predict the effects and impact of technology and education on economic growth (Kopf, 2006). The importance of knowledge and R&D is realized by firms as evident from the spending of the firms on knowledge and R&D. As much as one third of the firm's investment is geared towards knowledge-intensive goods (Economist, 2005).

The importance of knowledge is also captured in Romer's endogenous growth model which emphasizes that technological change is crucial to the heart of economic growth. Knowledge is broken into two components represented by the variables, H and A. H represents human capital which is the cumulative effect of activities such as education and on-the job training. A represents innovation, more specifically the count of innovation or ideas. Romer proposes the following equation:

$$\dot{A} = \delta H_A A$$

where \dot{A} , the number of new ideas at a given time, t, relates directly to the total human capital employed in research, HA, times A, the total stock of ideas or innovations that already exists, and a productivity constant, δ (Romer, 1990). Thus it can be stated that the theoretical case of a KBE rests on the notion of EGT (Floud and Johnson, 2004). KBE encompasses the attributes stated in the EGT such as human capital, knowledge, innovation and technology. These attributes are believed to be critical success factors in the long-term economic growth rate.

Knowledge and information have increasingly become the basis of modern day economies where knowledge has been recognized as the driver of productivity and economic growth. The term KBE "stems from the fuller recognition of the place of knowledge and technology." Even organizations like the Organization for Economic Co-Operation and Development (OECD) are finding it important to understand the relationship between the endogenous growth theory and the knowledge-based economy. Information societies have emerged as a result of the growth of knowledge through its transmission through communications and computer networks which in turn lead to a learning economy where the need for skilled workers is required (Organization for Economic Co-Operation and Development, 1996).

However KBE is not just a digital economy, it is more complex and is a broader phenomenon. KBE has different dimensions and can be viewed from different aspects:

- 1) KBE is driven by a very powerful technological force that is caused by the rapid growth of information and communications technology (ICT). The growth of ICT particularly of telecommunications and networks has forced the human activity into a new mode and new spheres (Organization for Economic Co-Operation and Development, 1996).
- 2). Knowledge today is supported by cultural and spiritual values and has become an important factor in social, economic, technological, and cultural transformation.
- 3). The integration of the enormous economic resources of economies has become possible because of the emerging KBE's, thereby stimulating the development of countries and in the process allowing them to be equal participants in the global development process (Organization for Economic Co-Operation and Development, 1996).
- 4). Societal activities in various countries, such as institutional and innovation systems, human resource development have been affected with the emerging knowledge-based economies. "KBE has become an engine of progress in every country" (National Information Technology Committee, 2002).

Developed and developing countries are making efforts to establish themselves as knowledge-based economies. Malaysia and Thailand too have realized the importance of a move towards the knowledge-based economy in order to become competitive. The next section of this paper presents the efforts the governments of the two countries have made in fulfilling the dream of achieving a knowledge-based economy. This paper will attempt to study the efforts made by Thailand and compare it with its economic and political neighbor and rival – Malaysia. Section 2 will discuss development processes and strategic actions to enhance KBE in Malaysia and Thailand. Section 3 draws comparisons between the two countries and presents the conceptual framework. Section 4 proposes policy recommendations for knowledge economy in Thailand and concludes.

2. Development Processes of Knowledge-Based Economy: Malaysia VS Thailand

In 1991 Malaysia created a long term program called Vision 2020, a name conceived under prime minister Mahathir Mohamad. According to Mahathir "some have wondered why 2020 and not some other year. As a doctor I am attracted to the optometrist measurement of vision; 2020 indicates 100 per cent good vision in both eyes. Our 2020 vision for Malaysia implies this clear vision of where we want to go and what we want to be" (Mohamad, 2007). The aim of this program was to turn Malaysia into a fully industrialized country and to give it the status of a developed country. The aim was also to quadruple the per capita income by 2020. This means that Malaysia will have to climb the ladder of production from a low-tech to high-tech type of industrial production (Drabble, 2004). The challenge of globalization and a knowledge-based era has made it vital for Malaysia to move towards a KBE. In the foreword of the Eight Malaysian Plan 2001-2005, Mahathir said "during the Eight Malaysia Plan period, we will be faced with even greater challenges from globalization and liberalization as well as the rapid development of information and technology. We will have to shift the growth strategy from being input-driven towards one that is knowledge-driven" (Abdulai, 2004).

In order to attain the status of a developed country by 2020, Malaysia has integrated the development of a KBE into its new vision policy. Two components of the new vision policy are:

- 1). to develop a KBE as a "strategic move to raise the value added of all economic sectors and optimizing the brainpower of the nation; and 2). "strengthening human resource development to produce a competent, productive, and knowledgeable workforce." (Abdulai, 2004). A substantial knowledgeable workforce has to be created therefore Malaysia has developed plans to strengthen its human resource pool as follows:
- 2) to expand the supply of highly skilled and knowledgeable manpower in order to support the development of a knowledge-based economy.
- 3) to increase the accessibility to quality education and training in order to enhance income generation capabilities and quality of life.
- 4) to improve the quality of education and training delivery system in order to ensure that manpower supply is inline with technological and market demand"
- 5) to promote lifelong learning to enhance employability and productivity of the labor force.

Besides plans to create a strong and skilled human resource pool that will have access to quality education, the Malaysian government has also been highly involved in the process of moving towards a KBE. The government of Malaysia has set up measures to set up institutions, infrastructures, and infostructures that will help move the country towards a KBE. Some of these include the following: 1). National Information Technology Council (NITC), 2). the Malaysian Institute of Microelectronic Systems (MIMOS) 3). the Multimedia Super Corridor (MSC) project 4). the New Multimedia and Cyber laws and 5). The Human Resource Development Council Funding for Training (HRDCF) (Abdulai, 2004). The details of each of the measures taken are discussed further in this section:

- 1) National Information Technology Council (NITC)–The NITC was set up in 1994 with the aim of serving as advisor to the government of Malaysia on matters related to ICT. But the greater aim of NITC was to create (in order) an information society, followed by a knowledge society, and finally a value-based knowledge society.
- 2) Malaysian Institute of Microelectronic Systems (MIMOS)–MIMOS, established in 1985 was established to serve as a research and development (R&D) organization with three main core sections which are: technology, policy, and business.
- 3) Multimedia Super Corridor (MSC) project–The MSC project was created in 1996 and is divided into three phases that spans from 1996 to 2020. The vision that the government of Malaysia had in creating the MSC was to attract global companies to locate in this region that would provide them with world-class environment for ICT. The effort to move Malaysia towards a knowledge-based economy is enormous therefore flagship applications have been developed to help charter this course. Flagships such as Electronic Government Flagship, National Multi-Purpose Card Flagship, Smart School Flagship, Telehealth Flagship, R&D Clusters Flagship, Technopreneur Development Flagship, and the Multimedia Development Corporation (MDC).
- 4) New Multimedia and Cyber laws–The benefit of advancement in technology has led to growth, however the challenge of laws must also be addressed. In order to address this issue the government of Malaysia has passed several cyber laws such as: the Digital Signature Act which took effect in October 1998, Copyright Amendment Act which took effect in April 1999, Computer Crime Act which took effect in June 2000. The other acts that have existed are the following: the Telemedicine Act in 1997, and the Communications and Multimedia Act in 1998.
- 5) Human Resource Development Council Funding for Training–According to renowned British economist Alfred Marshall “the most valuable of all capital is that invested in human beings.” Therefore for Malaysia, the development of human capital has become one of the most important priorities in its efforts to move to a knowledge-based economy. Not only will the human capital help achieve the status of a developed country and a knowledge-based economy but it will also help with the challenges of globalization. The government’s strategy in creating the HRDCF was to ensure that unskilled or low skilled Malaysians would receive training necessary to equip them with skills needed for the knowledge-based economy (Abdulai, 2004).

Thailand’s efforts to transform the Thai economy into a KBE, on the other hand, began with the initiation of the IT 2000 (1996-2000) policy framework established in 1996. The target for the IT 2000 policy framework was to establish a basic foundation for the ICT infrastructure including human resource development. The first policy framework was followed by a second policy framework called IT 2010 (2001-2010), established in 2001 and was approved by the Cabinet in March 2002. The IT 2010 policy framework sets a higher goal of the transformation to a KBE. The IT 2010 policy framework has three objectives stated as follows:

- 1) “to upgrade the status of Thailand’s technological capability from a “dynamic adopter” into a “potential leader.” (which will be measured using the United Nations Development Program’s Technology Achievement Index).
- 2) “to increase the number of knowledge-based workers in Thailand from 12 percent to 30 percent of the total labor force.”
- 3) to increase the proportion of knowledge-based industries to 50 percent of the country’s GDP.”

Five main areas have been targeted as areas of development as set forward as the strategy of the IT 2010 policy framework. The five main areas are as follows:

e-Society, e-Education, e-Government, e-Commerce, and e-Industry (The Government Public Relations Department, 2004). Figure 1 illustrates the ambition of the IT 2010 policy framework.

The five pillars comprise the IT 2010 flagships and the three supporting components comprise the IT 2010 cross-cutting infrastructure (National Information Technology Committee, 2002). The details are what are planned for each pillar is discussed in the next section of this paper. There are five pillars planned by the Thai government as follows:

- 1) e-Society–In creating an e-Society, the government aims to eliminate or at least reduce the digital divide thereby creating equal opportunities for Thais to develop their quality of life.
- 2) e-Education–The Ministry of ICT established the Thailand Knowledge Center which has the objective of storing, processing, and disseminating knowledge (both explicit and tacit). E-Education also involves the use of ICT for educational development so that Thais are able to achieve a better quality of life.
- 3) e-Government–“involves the use of ICT tools, such as the Internet and electronic systems, to enhance the efficiency of major systems in national administration. The e-Government program is part of the e-ASEAN and e-Thailand initiatives. It will provide services to citizens more quickly and with greater efficiency. The Government intends to improve the ICT system and expand it for public services at all stages by 2010.”
- 4) e-Commerce–The main idea is to make use of e-communication in different types of businesses. Thailand has to pay

greater attention to developing the use of e-Commerce if she wants to be competitive because in 2001 the Economist Intelligence Unit ranked sixty countries in terms of their e-Business indicators, and Thailand was only placed in the third group.

5) e-Industry—The use of back office administration, logistics and marketing, plant management, production management, process control, and process measurement are the main components of the e-Industry (The Government Public Relations Department, 2004).

Besides the above mentioned pillars, the government has also established e-Learning projects as undertaken by the Ministry of ICT, the Ministry of Education, and the Ministry of Science and Technology. The Ministry of ICT has set up the following projects: National ICT learning center, One temple one e-Learning center (OTEC), Goodnet, Teacher Training, and National Grid Technology Center while The Ministry of Education is responsible for the Schoolnet and Uninet projects (Tongdhamachart, 2005).

The government also understands the importance of establishing cyber laws in particular the Electronic Transaction Bill, the Electronic Signature Bill, the National Information Infrastructure Bill, the Computer Crime Law, the Data Protection Law, the Electronic Funds Transfer Law, and the Credit Law (National Information Technology Committee, 2002).

3. Comparative Results of Knowledge-Based Economy between Malaysia and Thailand

The Gross Expenditure on R&D (GERD) for the public and private sectors for Malaysia and Thailand and the personnel in R&D per 10,000 population are presented in table 1 and 2. Table 3 shows the international test assessment scores such as the Trend in International Mathematics and Science Study (TIMSS).

The government efforts towards the establishment of the KBE for both countries presented shows that Malaysia's program to initiate the drive towards KBE started in 1991 while Thailand's started in 2001 hence giving Malaysia an added advantage and a head start with infrastructure, infostructure and institutions as evident from the setting up of the NITC, MIMOS, the MSC project, and the HRDFC. Malaysia is also ahead in terms of R&D expenditure and R&D personnel as evident from table 1 and table 2. The TIMSS test score may not be an entire indicator of human resource development but it provides an insight into the quality of education provided which in turn breeds improved human capital. Besides Malaysia also has established the HRDCF for training which aims to equip low skill workers to adapt to the KBE, an organization that Thailand clearly lacks.

The global services location index compiled by A.T. Kearney also shows Thailand to be behind Malaysia in the total score compilation as shown in table 4 and is also behind Malaysia in terms of competitiveness when compared to Malaysia (details presented in table 5).

The data presented above clearly indicates that Thailand still lags behind Malaysia in almost every aspect and should use Malaysia as the benchmark towards the progress towards KBE. Thailand can learn several lessons from Malaysia in its drive towards the KBE. Firstly, compared to Thailand, Malaysia has a better plan and a longer vision for a sustainable information economy. Not only are they striving towards the KBE but they also are on track towards creating a value-based knowledge society. In order to enable them to accomplish that the Malaysian government has set up the NITC that acts as an advisor to the government. Secondly, the setting up of the MSC has given Malaysia a head start and has put Malaysia ahead in this race towards the KBE. Examples of flagships created in the MSC are the R&D Clusters and MDC. Comparatively, Thailand is nowhere near the policies of establishing the above mentioned infrastructure and applications. Thirdly, even though technology leads to growth, the challenge is to ensure that issues such as laws must be addressed. Although Thailand has made initiatives with cyber laws, Malaysia is still ahead with more laws and acts being put into use. The Thai government's ICT policy should focus more rigorously on cyber laws ensuring that global standards should be met. And lastly, in its efforts to ensure that the Malaysian citizens are not left behind the government established the HRDCF that trains and equips people with skills necessary for the transition. The Thai government should initiate such policies as there is a big problem with the digital divide gap in Thailand.

Statistical indicators are important in understanding the degree/level at which an economy is becoming a KBE. A framework must first exist in order to be able to measure data statistically. Several frameworks have been created by several international organizations such as the OECD, Asia-Pacific Economic Cooperation (APEC), and the World Bank. Although different statistical indicators have been created for each framework, they can be categorized broadly into four dimensions which are shown in figure 2 where KBE is the dependent variable and the four dimensions are independent variables (Leung, 2004).

The proposed additions to the framework consist of the following variables which are also presented in figure 3:

- 1) government incentives,
- 2) improved human resource development, and
- 3) institutional factors.

These three variables are important to the development of KBE in Thailand because of the following reasons: Firstly, the market failure theory stresses that in a pure market economy (without government intervention), there is tendency for the private sector to invest very low (minimal) on knowledge and education. Therefore the government must gain incentive for the market to increase investment in knowledge. Secondly, understanding the EGT is crucial as the theory stresses on the importance of human capital (which is one of the components of the Thai KBE component) because human capital will lead to more learning by doing and spillover effects of knowledge. Thirdly, the transaction cost theory stresses the importance of institutions such as laws and regulations that reduce transaction cost of the private sector. If a country has good laws and regulations and good intellectual property rights protection, then the private sector would probably invest more in IT.

4. Policy Recommendations and Conclusion

To further understand the factors and effect of the degree of successful KBE one needs to understand the following 1) the market failure theory, 2) the EGT and 3) the transaction cost theory. In the recommended framework, the degree of KBE acts as the dependent variable while government incentives, better human capital, and institutional factors act as independent variables. This section proposes policies and recommendations that can be used for each component of the new framework.

4.1 National public policy on Innovation/Institutional factors

The Thai government should aim to enhance investment potentialities in intellectual property and innovation, as well as the commercialization of the property. Despite an increase of R&D, the investment of Thailand in R&D still lags behind other developed countries. The government should establish an incentive for intellectual property and invention. In action, research and development should be set forth as a national agenda and incorporated into the National Economic and Social Development plan, as well as other related government strategies. Incentives may be either monetary or non-monetary. In non-monetary incentives, invention and intellectual property may be calculated as a component in Key Performance Indicator (KPI) of an organization or a petition for academic title. In the private sector, an inventor should be credited with tax incentives and marketing support. Government however should generate social, rather than private returns through reasonable period of IPR protection and public-private transfer of knowledge (Pholphirul and Bhatiasevi, 2008).

4.2 National public policy on Information and Communication Technology

Several researchers show that investment in ICT contributes to productivity and economic growth (Jorgenson, 2001). In countries such as Japan, the economic growth is dominated by investment and productivity growth in information technology (IT) (Jorgenson and Namura, 2005). Although the number of Internet users and Internet bandwidth has been increasing, Thailand still lags behind other developed countries. Thailand has to steadily invest in telecommunication infrastructure and Internet connectivity. The government should also do more to integrate IT into the classrooms. Although initiatives have been made towards this in the form of National IT 2000 and National IT Policy 2010, there is still no legislative or measurement such as the key performance indicator (KPI) of how successfully are IT and education being integrated.

Infrastructure such as the MSC in Malaysia with state-of-the art information, communication, and physical facilities should be provided by the government. The efforts to build these facilities should also be implemented outside of Bangkok as the need to bridge the digital divide remains crucial to the development of KBE.

The government should also push initiatives to promote IT and business process outsourcing (BPO). Initiatives should be taken by Software Information and Promotion Agency (SIPA) to ensure that Thai software firms have an opportunity to compete globally. The government should encourage the building and incubation of the Thai-based venture capital sector as Malaysia already has over 200 venture capital companies with about 25 focusing exclusively on technology. The government should provide support with funding and revise outdated regulations. If the government continues to lack vision, support, limits the access to investment capital, and lacks regulations such as those governing security or privacy then the move towards the KBE will be slower than anticipated.

4.3 National public policy on Human Resource Development/Improved Human Resource/Government Incentives

In order to develop human resource equipped with skills necessary for the KBE the government should develop two main areas which are education and human resource skills. In order to improve education the government must look at improving the quality of education provided in schools. This quality can be improved firstly by recruiting quality instructors. The first step towards improving the quality of education should start the primary and secondary levels followed by universities. Universities should be given more autonomy to make decisions and provide competitive salaries to attract faculty members. The government should also emphasize research among universities. Increased funding and access to them should be a primary target. Incentives for conducting research and lab facilities should be provided for faculty members and students to indulge in active research. The government should also provide grants that encourage universities to collaborate with the private sector. Intermediary organizations should be established to

bridge the gap between universities and organizations. The role of these organizations would be important for those faculty members that lack first hand knowledge of the technical details of the private sector firms (The World Bank, 2008).

Human resource skills should be improved as there is a shortage in Thailand for people with science, engineering, language, and communication skills. Students graduating universities are doing so at the ratio of 62:38 in favor of the social sciences rather than pure science. The government therefore must also provide continuous training to the employees or encourage the private sector to do so in the form of in-house training or outsourcing the training. What the government can also do is study the approaches adopted by countries such as the US, the UK, Canada, Korea, Israel and other countries. And that approach is to assist the funding of programs which help finance post-doctoral internship positions in participating firms. (The World Bank, 2008).

4.4 National public policy on business environment

The government should prioritize the following objectives: 1). improving the policy framework and 2). creating a more favorable environment for firms' innovation. The objectives can be accomplished if the government continues the openness in goods and increases the openness in services such as the financial sector and look to enhance the efficiency of the labor market (The World Bank, 2008).

In conclusion, this paper defined the KBE as the term that "stems from the fuller recognition of the place of knowledge and technology." The development and growth of a KBE in two developing countries, namely Malaysia and Thailand were presented with emphasis on the government efforts to move Malaysia and Thailand to a knowledge-based economy respectively. A comparison was made between the two countries with data being presented in tables for the following categories: 1) gross expenditure on R&D (GERD) for the public and private sectors, 2) personnel in R&D per 10,000 population.

3) TIMSS Test Score, 4) global Services Location Index, and 5) competitiveness comparison between Malaysia and Thailand. The data showed that Thailand is behind Malaysia in almost all of the data and index presented. The conceptual framework established for statistically measuring the success of knowledge-based economy (KBE) comprise of the following variables: 1). innovation, 2). ICT, 3). human resource development and 4). business environment. Recommended additions to the framework were proposed in this paper based on the integrating the following variables: 1). government incentives, 2). better human capital, and 3). institutional factors. Furthermore, the findings in the paper shows that Thailand is lagging behind Malaysia in several aspects such as planning and long term vision, investment in R&D, cyber laws, government efficiency, business efficiency, infrastructure, policies that support the shift towards KBE and human capacity building. Thailand should therefore use Malaysia as a benchmark and make efforts like they have by improving the above mentioned aspects in its drive forward towards the KBE.

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Table 1. Gross Expenditure on R&D (GERD) for the public and private sectors

Country	Public Sector	Private Sector
Malaysia (2002)	82%	0.25%
Thailand (2004)	36%	0.69%

Source: National Science and Technology Development Agency (NSTDA), 2006.

Table 2. Personnel in R&D per 10,000 population

Country	Public Sector	Private Sector
Malaysia (2004)	4.6	2.4
Thailand (2003)	5.5	1.2

Source: National Science and Technology Development Agency (NSTDA), 2006.

Table 3. TIMSS Test Score

Country	Math	Science
Malaysia (1999)	519.26	492.43
Thailand (1999)	467.38	482.31

Source: Mullis *et al*, 2000.

Table 4. AT Kearney Global Services Location Index, 2005

Economy	Financial Structure	People and Skills Availability	Business Environment	Total Score
Malaysia	2.95	1.12	2	6.07
Thailand	3.27	0.94	1.51	5.72

Source: AT Kearney Global Services, 2005.

Table 5. Competitiveness comparison between Malaysia and Thailand

IMDB 2005-06	Malaysia	Thailand
Overall Ranking	23	32
Economic Performance	11	21
Government Efficiency	20	21
Business Efficiency	20	28
Infrastructure	31	48

Source: IMD World Competitiveness Yearbook, 2005, 2006.

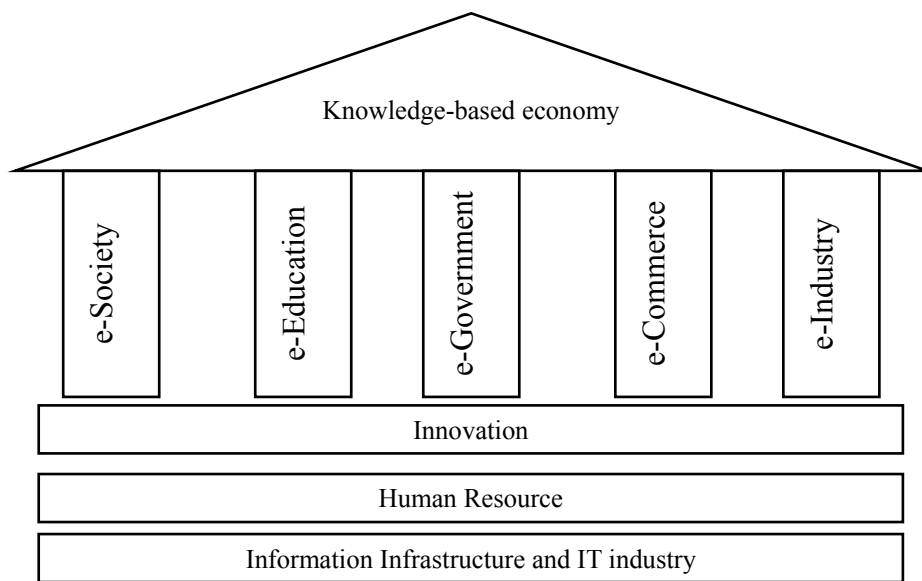


Figure 1. IT 2010 Dimensions

Source: National Information Technology Committee (2002)

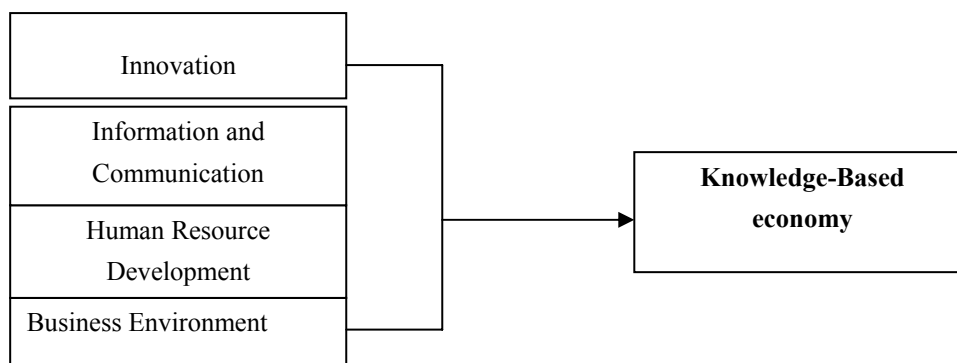


Figure 2. Conceptual framework

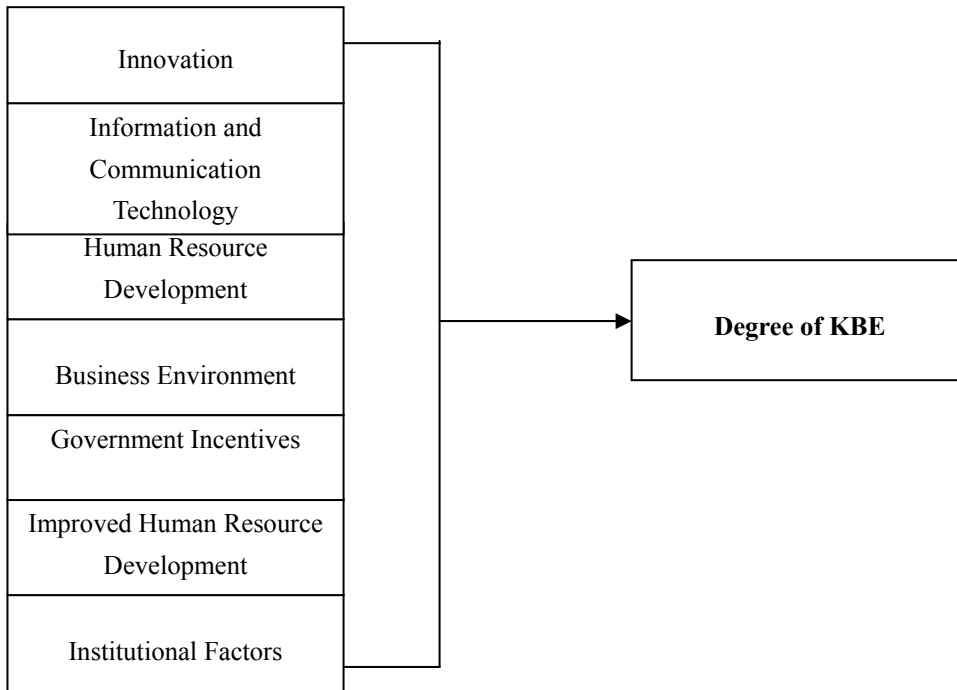


Figure 3. Proposed additions to the conceptual framework