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Investing in Human Capital as a Mechanism to Stay Aligned with the Evolving Needs of Transitioning to a Knowledge-Based Economy: A Review of Malaysia's Experience

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Abstract:

This study aims to highlight the role and significance of investing in human capital in enabling nations and societies to adapt to the demands of the knowledge economy, emphasizing the necessity of adopting an appropriate strategy. This approach has been applied by Malaysia, which has positioned itself as a leader in this field. To achieve the objectives of this study, a descriptive methodology was employed, involving the presentation of concepts related to the variables of the study.

The findings reveal that Malaysia's increasing focus on investing in the three primary components of human capital—education, training, and biotechnology—has significantly and effectively contributed to its successful alignment with the evolving needs and prerequisites of transitioning to a knowledge-based economy.

Keywords: *knowledge economy; human capital; investment*

Jel Classification Codes : *A12, J24, E22*

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1. Introduction :

In the past, many researchers, economic agents, and decision-makers around the world believed that true investment revolved solely around the exploitation of physical capital, such as machinery and equipment. Societies aiming to increase their income were encouraged to direct substantial resources toward investment in physical capital, as it was seen as the sole contributor to increasing GDP (economic growth). Education, in contrast, was regarded as a form of consumption that depleted societal wealth, as it did not produce tangible goods or services directly. However, as economic researchers delved deeper into the benefits of education, many came to realize its vital role in increasing the wealth of nations and societies. Economists such as Adam Smith, Malthus, Ricardo, and Alfred Marshall were among the pioneers who emphasized the significance of education, particularly as economic measurement tools became more advanced. Researchers such as Schultz and others discovered that increases in GDP were not solely attributable to growth in physical capital or labor but also stemmed from other factors, including education, when education was introduced as a variable to explore its relationship with GDP growth, it was found to play a substantial role in increasing GDP. It was established that education is not merely consumption but rather an investment. This realization led to the emergence of the concept of investing in human capital. Many researchers argued that human capital investment is as crucial as, if not more important than, investment in physical capital, especially in light of technological and technical advancements that demand higher skill levels from individuals. This makes education and training essential prerequisites for achieving global competitiveness.

Research Problem:

In light of the above, the research question can be framed as follows: How has Malaysia's investment in human capital contributed to meeting the conditions and requirements of transitioning to a knowledge-based economy?

Research Hypotheses:

To answer the research question, the following hypotheses were formulated:

- ✓ Education and training are among the most prominent elements Malaysia has relied on to meet the conditions of transitioning to a knowledge-based economy.
- ✓ Investment in human capital through the development of biotechnology fields in Malaysia contributes to meeting the requirements of a knowledge-based economy.

Research Objectives:

This study aims to achieve the following objectives:

- Highlight the role and importance of investing in human capital in enabling nations to meet the demands of a knowledge-based economy, particularly in developing countries such as Algeria.
- Identify the conditions and prerequisites necessary for nations to transition to a knowledge-based economy.
- Examine the keys to Malaysia's success in human capital investment and its contributions to meeting the requirements of a knowledge-based economy.

Research Significance:

The significance of this research lies in its attempt to highlight the role and importance of investing in human capital in enabling nations to meet the demands of a knowledge-based economy. It aims to facilitate a rapid transition from traditional economic concepts to knowledge-based economy concepts.

Research Methodology:

To address the research topic from various dimensions and achieve its objectives, a descriptive methodology was adopted. This involved collecting information from sources and analyzing it to derive the desired results.

Research Structure:

This study is structured as follows:

- **Chapter One:** Human Capital Investment: Concept and Evolution.
- **Chapter Two:** The Knowledge Economy.
- **Chapter Three:** Malaysia's Experience in Human Capital Investment to Meet the Conditions and Requirements of a Knowledge-Based Economy.

Previous Studies:

Numerous studies have addressed this topic from various perspectives, including:

- **Study by Fawzia Kadeed (2012):** This study aimed to analyze human capital, its components, characteristics, and the considerations required for investment. It also explored various methods and approaches for investing in human capital in the context of a knowledge economy.
- **Study by Elena Pelinescu (2015):** This study examined the role of human capital as a factor of growth. It concluded that the human capital strategy adopted by the European Union to achieve growth focused on three fundamental elements: intelligence, sustainability, and inclusiveness.
- **Study by Mohamed Falaq and Abdelhadi Medah (2017):** This research reviewed several studies focusing on the relationship between human capital and economic development across different countries. It sought to determine the nature of this relationship and proposed a model for investing in human capital to enhance human development levels and enable a transition from a resource-based economy to a knowledge-based economy, thereby improving economic growth and development levels.
- **Study by Olha Podra et al. (2019):** This study investigated the impact of human capital on fostering innovative development and shaping a knowledge economy in Ukraine. The findings revealed that productive knowledge and quality education are fundamental to a knowledge-based economy.

The added value of the current study compared to the aforementioned research lies in identifying the key components of human capital that Malaysia invested in to meet the requirements of transitioning to a knowledge-based economy, through an in-depth review of its experience in this field.

2. Human Capital Investment: Concept and Evolution

2.1. Concept:

Human capital is viewed as the added value in the productivity of individuals, encompassing the cognitive and technical skills acquired through education and experience. Economist Kendrick defined human capital as intangible intellectual capital accumulated through investments in education and research, aiming to enhance resource efficiency in the future (Mohamed & Mohamed, 2000, p. 1). Although human capital theory did not fully develop until Schultz's studies, the actual roots of these concepts date back to the 18th century, where attempts were made to draw attention to the role of human elements and define the essence of human capital. These efforts also included incorporating individual potential as a component and focusing on investing in human elements to improve personal capabilities, evaluate the economic importance of human resource reserves, and determine the economic value of individuals for society. Additionally, these studies evaluated the material benefits of human capital derived from migration, health investments, and training.

Schultz focused his research on more effective explanations for income growth, shifting attention from material components of capital to the less tangible components—human capital. Schultz observed that researchers often neglected human wealth, prompting him to conduct an objective analysis of this resource. His work contributed significantly to the theory of human capital investment aimed at achieving economic development. Schultz's concept of human capital investment was built on three foundational assumptions (Aqeel & Al-Akeeli, 1998, p. 157):

- Economic growth that cannot be explained by increases in material inputs is primarily due to the accumulation of human capital, initially identified as the residual factor, which later became synonymous with human capital investment.
- Differences in income can be explained by variations in human capital investment.
- Income equality is achieved through increasing the ratio of human capital to traditional capital.

Schultz emphasized the importance of education as a necessary investment for human resource development, framing it as a form of capital. He argued that education, as a part of an individual's being, cannot be sold, bought, or treated as organizational property.

Building on Schultz's work, economist Jacob Mincer attempted to measure the cost-benefit outcomes of investing in education and training. Mincer's human capital model explains income distribution variances by assuming that wise career choices equalize the present value of income over an individual's expected lifetime. His findings include the following conclusions (Nick, 2002, p. 234):

- Higher levels of education increase the likelihood of receiving workplace training.
- Human capital growth is positively influenced by education, employee satisfaction, and organizational stability.
- Higher unemployment rates increase the cost of training investments.
- Specialized training investment increases employee retention and organizational stability.

2.2. The Importance of Human Capital:

The concept of human capital holds immense importance due to its significant contributions to the development and progress of societies. It prioritizes human development quantitatively,

qualitatively, and in-depth (Hamid, 1998, p. 6). For instance, in light of technological advancements, the demand for jobs requiring basic skills has decreased, while demand for new roles centered on knowledge has risen. This shift has altered the relative importance of production factors, necessitating the quantitative and qualitative development of human capital (Nations, 2001, p. 19).

From a practical standpoint, education is one of the fundamental elements of economic development and the improvement of human well-being and human capital. With the intensification of global economic competition, education has become an essential source of competitive advantage, playing an undeniable role in human development (UNESCO, 2005).

Among the factors contributing to the proliferation of studies on the economics of education is the organization of specialized conferences on the topic by universities, institutes, and international organizations (Falaq & Medah, 2017, p. 18).

Research findings on human capital and labor market policies indicate that the development of an individual's human capital relies on the "human capital" theory, which highlights skill differences among workers based on education level or personal abilities. Skills cannot be acquired solely in the labor market but are accumulated through human capital development during employment (Shindler, 2002).

Additionally, a study conducted in Kosovo on human capital and unemployment in transitional economies found a significant correlation between high unemployment rates and increased migration levels. Using data extracted from employment offices and surveys, the study estimated an alarmingly high unemployment rate among the working-age population, with a concurrent rise in migration probabilities. The data further revealed higher unemployment rates in rural areas compared to urban ones, and migration probabilities were also higher in rural areas. Moreover, while unemployment rates were lower among educated individuals, their likelihood of migration was higher (AudullahHoti, 2006).

2.3. The Benefits of Investing in Human Capital:

When economists initially attempted to measure the resources driving economic growth, the topic was clouded with ambiguity and a lack of precision in identifying determinants and influencing factors. It later became evident that human capital played a pivotal role. Studies on the growth of the U.S. economy and wealth resources in various countries worldwide have clarified that human capital (citizen skills) is a leading factor in explaining productivity disparities and inequality among nations (HECKMAN, 2005).

Human capital is a valuable and distinct form of capital, expensive to acquire like physical capital. Similar to physical capital, its benefits materialize after a period of time. Therefore, organizations strive to invest in their human capital to ensure its uniqueness and excellence (Kadeed, 2012, p. 251).

The term "human capital" is often associated with dehumanizing societal views that equate individuals with machines. However, the concept of human capital highlights the importance of individuals, potentially even surpassing the importance of physical capital in wealth creation. Human capital investment is a relevant concept for many countries, and understanding how human capital influences the economy and how nations should promote and improve its productivity requires consideration of the following (HECKMAN, 2005):

- Human capital is a productive element due to its impact on enhancing the skills of those invested in. For example, training an accountant to become highly skilled in their field improves their accounting performance, illustrating the clear effects of enhancing individuals' skills.
- Human capital improves individual adaptability and resource allocation efficiency. Skilled labor is more effective in resource allocation and better equipped to adapt to changes and respond to new opportunities.

These benefits of human capital investment are particularly significant in today's business environment, characterized by changing labor and capital markets that align with various global economic sectors.

3. Knowledge Economy:

3.1 Definition and Characteristics:

Information technology has propelled societies into the era of information explosion and the emergence of new knowledge, particularly in the field of electronic services. Information technology has created what is now referred to as the knowledge economy, which has replaced the industrial-based economy. This is because knowledge, rather than industry, has become the key driver of economic growth in the modern era. Knowledge is now one of the most crucial resources for any economic activity, with the flow of knowledge being the most critical factor for the success and continuity of such activities.

The simplest and most clear definition of knowledge is that it represents the final stage in the transformation of data into information and then into knowledge. This transformation occurs within an enabling knowledge environment, requiring an interconnected relationship between data and information. The growing role of knowledge across all fields has become particularly evident in the economic domain. While industrial economy foundations relied on natural resources, the knowledge economy focuses on knowledge assets such as patents, technical expertise, documents, and software, emphasizing the adaptation of these new assets to meet the needs and conditions of activities, rather than relying solely on natural resources.

From this perspective, a group of economists and financial experts has emerged advocating for the knowledge economy and its unique resources as tools for enabling organizations to achieve their goals while staying competitive and innovative (Al-Adham, 2006, pp. 25-27).

The knowledge economy, at its core, is a service-based economy that relies on a robust infrastructure of information and communication technology (ICT) systems, along with transportation and trade networks. Without these facilities, it is impossible to speak of a transition toward a knowledge economy.

Knowledge, therefore, is the foundation for innovation, which in turn drives technological change—the primary mechanism for achieving competitiveness and creating new markets (Hamid, 2002, pp. 44-45).

The fundamental characteristics of the knowledge economy can be summarized as follows (Aboud, 2005, pp. 191-193):

- The primary production factor in the knowledge economy is knowledge itself, unlike other economic sectors that rely on tangible production factors.

• The knowledge economy focuses on intangible assets, unlike other sectors that emphasize material and tangible factors.

• The outputs of this sector include ideas and trademarks rather than land, machinery, or inventory.

• As a networked sector, its outputs are delivered via new markets and through advancements in communications technologies such as the internet and mobile phones, which have surpassed the institutional structures of traditional economic sectors.

• Time has little influence on the outputs of this sector, as time and location constraints have significantly diminished, and the cost of establishing activities has also drastically decreased.

• Modern markets are electronic, with the rapid flow of information challenging all constraints imposed by traditional market sizes.

3.2 features of the Knowledge Economy

The most significant features of the knowledge economy in business organizations are as follows (Al-Shabeeb, pp. 12-13):

• The relative importance of knowledge workers, also referred to as "gold-collar workers," has increased. They now constitute an estimated 70% of the workforce in projects, and they are the primary resource owners in the new capitalist system. Knowledge workers represent the most critical factor in today's economy.

• Intellectual capital, considered a highly competitive weapon within the knowledge economy, generates added value. It can be transferred outside the organization when employees return to their roles, as intellectual capital is intangible. This highlights the rising importance of human talent and its relatively independent role in the knowledge economy.

• The marginal cost of producing additional copies of knowledge is low or nearly zero. This fundamentally changes the traditional economic theory advocating the importance of economies of scale. In the knowledge economy, it is possible to produce large quantities indefinitely.

• Knowledge has economic value in exchange after its use. Without use, it has no exchange value, unlike goods whose value is inherent.

• The principle of increasing returns governs the knowledge economy, as its rules and principles are based on increasing returns compared to the diminishing returns seen in traditional economies.

• Knowledge-based products are abundant rather than scarce, contrasting with traditional economics, which originated from the concept of scarcity. In the knowledge economy, scarcity relates to attention and focus (non-material scarcity), which can be overcome by increasing knowledge.

• In traditional economies, growth was linear. However, the dominant growth pattern in the new economy is unconventional and exponential.

3.3 Requirements and Pillars for Transitioning to a Knowledge Economy:

The main requirements for transitioning to a knowledge economy, as identified by the World Bank, can be summarized as follows:

- An economic and institutional system that provides incentives for the efficient use of both existing and new knowledge, fostering entrepreneurship.
- The availability of educated and skilled individuals who can create, use, and share knowledge effectively.
- A dynamic information infrastructure to facilitate efficient communication, dissemination, and processing of information.
- A highly efficient innovation system comprising companies, research centers, universities, consultants, and other organizations that can access the growing global stock of knowledge, absorb these innovations, adapt them to local needs, and create new technologies.

Additionally, efforts to link the knowledge economy with electronic work institutions have identified the following key pillars (Saleh & Saleh, 2002, pp. 24-72):

- Establishing an infrastructure for electronic business to transition to a knowledge economy;
- Information systems and e-commerce as fundamental pillars of the knowledge economy;
- Intelligent information systems;
- Digital valleys, villages, and smart cities as critical means to launch various industrial sectors;
- Investment in human knowledge assets as a cornerstone of the knowledge economy;
- Promising industries with competitive advantages;
- Establishing a unified center to facilitate government services.

4. Malaysia’s Experience in Investing in Human Capital to Meet the Conditions and Requirements of a Knowledge Economy:

Malaysia is one of the countries referred to as the "Asian Tigers," a title earned after substantial efforts to transform its weak economic and social reality. Decision-makers in Malaysia faced numerous pressures and crises in their quest for development. However, through their efforts, Malaysia achieved significant international recognition due to its leading position among developing countries, driven by political and economic stability. Notably, Malaysia’s success in achieving progress and prosperity while addressing poverty and underdevelopment can be attributed to its emphasis on education and investment in human capital, which has served as the fuel for its development.

4.1 Biotechnology:

Malaysia has made significant strides in transitioning from a traditional economy to a knowledge economy. This transition was accompanied by increased investments in human capital, recognizing it as the key factor in the process. Scientific and technological indicators have played a crucial role in Malaysia’s knowledge economy. In 1976, Malaysia implemented its first science and

technology policy, followed by an industrial development plan in 1990. Over more than two decades, Malaysia successfully integrated its science and technology development plan with efforts to strengthen infrastructure and build human capacities in the field. The country established mechanisms to finance research and development (R&D), recognizing that science and technology offered the greatest opportunities for funding innovative ideas with high competitiveness.

Continuous growth and prosperity depend on the rapid development of technology and innovation, applied in both traditional and new industries, such as information and communication technology (ICT) and biotechnology. This reliance on technological competence has become a necessity to transform Malaysia into an advanced nation (Hamdallah, 2011, p. 15).

4.2 Education:

The growing focus on education in Malaysia stems from its recognition that education is not merely about imparting information but is an essential component of logical thinking, equipping individuals with the ability to solve problems and face challenges. Education is regarded as the country's true investment in preserving societal values (Saleh M., p. 103).

4.2.1 The Malaysian Plan for the Period (1969-1973): This plan was designed to address the educational crisis among the Malay population, who feared the impact of new values instilled by educational institutions on their original values. Islamic values held a prominent place in Malay culture, prompting Malaysia to develop a plan to achieve balance among various ethnic groups, particularly in the economic field. This led to the launch of the "New Economic Policy," which many analysts regard as the most influential educational legislation. The state focused on achieving equality in education among ethnicities, emphasizing the importance of private and technical education as well as learning English alongside Malay.

4.2.2 The Malaysian Plan for the Period (1996-2000): This plan aimed to advance Malaysia's development policies across all sectors, including education. The main goal of educational policies was to create the necessary human capital to meet the country's basic and evolving needs. The plan emphasized providing sufficient financial resources for educational programs and improving the quality and efficiency of the education system in alignment with the 1976 Education Act. Additionally, it prioritized teacher training and skill development while ensuring adequate housing for teachers through collaborations between the state and the private sector.

The plan also focused on raising parental awareness about the importance of balanced education through curriculum development and increased opportunities for studying science and mathematics. Furthermore, it encouraged students to participate in school activities and fostered collaboration among parents, teachers, and the community to find effective solutions to emerging educational challenges.

4.2.3 The Malaysian Plan for the Period (2001-2005): Referred to as the "Development Plan," this phase concentrated on transferring knowledge to build a knowledge-based economy. It prioritized the quality of educational programs and aimed to narrow the educational gap between rural and urban areas—a persistent challenge in Malaysia's education system. This plan, known as the "National Vision Policy," included efforts to improve primary education through greater use of ICT, particularly in rural areas, and the implementation of the "Smart Schools" initiative. For secondary education, the plan called for the construction of more schools to accommodate a growing number of students, while encouraging private sector involvement in establishing private universities.

4.2.4 The Future Vision for Education in Malaysia: Malaysia's overarching vision is to become an advanced nation. This vision includes nine key challenges, with education and human capital development as priorities. Despite having one of the best education systems in the developing world, Malaysia must continue improving educational standards to enhance citizens' skills, linguistic competencies, and aspirations for excellence. Malaysia's future relies on its commitment to research and studies, as reflected in the following elements:

- Comprehensive collaboration with Harvard University to establish databases for collecting, analyzing, and interpreting information about lessons, curricula, and students;
- Funding for research and studies provided by the Ministry of Education and other ministries, as well as support from companies and factories;
- Emphasis on innovation in teaching mathematics and science, targeting students who work and study simultaneously;
- Support for outstanding students by establishing special schools with boarding facilities, providing academic and personal development opportunities;
- Transforming public schools into "smart schools" that utilize modern technologies, with plans to expand these schools nationwide.

4.3 Technical Education and Vocational Training:

There are numerous providers of technical and vocational training in Malaysia, with the government remaining the primary provider through various ministries and agencies:

4.3.1 Ministry of Education: Technical and vocational training is provided in secondary schools, known as technical or vocational secondary schools, with enrollment reaching 13,448 in 1990, covering ten major vocational clusters.

4.3.2 Ministry of Higher Education: Technical and vocational training is offered through a group of institutes and community colleges. Additionally, apprenticeship and training occur at the higher education level in specialized universities, referred to as technical universities.

4.3.3 Ministry of Human Resources and Development: Training is provided under the supervision of the Department of National Skills Development for vocational training and industrial training institutes. It is worth noting that a Vocational Training Council was established in 1989, following the reorganization of national industrial training in 1971. This council developed 53 trade standards across various vocational clusters and tested 15,379 candidates in 1990.

4.3.4 Ministry of Skill Development Centers: This ministry operates in nine Malaysian states, addressing the training needs required by national institutions. These centers are financially supported by the state and industrial sectors as an initial initiative to make them self-financing in the future, although most still require significant funding, especially from the youth and sports ministry, which established the National Institute of Youth Skills (Zain, 2020).

It is important to highlight the role played by both the public and private sectors in funding vocational training. In the public sector, funding is directed through various ministries responsible for specific aspects of Malaysia's education and training system. Meanwhile, the private sector plays a vital role through two main avenues: firstly, private institutions establish colleges run on a

commercial basis; secondly, private colleges and other training institutions, such as skill development centers, rely heavily on private funding to cover their operational costs.

4.4 Malaysia's Vision for Transitioning to a High-Tech Nation by 2030

With countries competing in technological advancement, Malaysia has announced its entry into the race for modernization. It launched a new policy known as the National Biotechnology Policy (DBN), built on three main pillars: agricultural biotechnology and food security, healthcare and well-being, and biotechnology in manufacturing and the circular economy. This new strategy aims to empower the sector in line with Malaysia's aspirations to become a high-tech nation by 2030.

This policy will also enhance the current biotechnology ecosystem while acting as a key enabler in addressing national challenges related to food security, pandemic management, and climate change through local biotechnology solutions.

During the policy's launch ceremony at the Kuala Lumpur World Trade Center, the Malaysian Prime Minister stated, "Biotechnology is an integral part of national health security, playing an important role in overcoming infectious and non-communicable diseases."

In this regard, the Prime Minister announced the government's plan to establish the Malaysian Alliance for Biotechnology Centers to empower the biotechnology ecosystem and determine its strategic direction, focusing on maximizing value, public good, and societal well-being.

The alliance, comprising all biotechnology-based institutions and research institutes, will create a specialized advisory body to advance the national agenda with greater focus, leveraging the country's strengths. This includes leveraging Malaysia's rich biodiversity, which underpins the three biotechnology sectors outlined in the policy. The alliance will also support biotechnology research and development.

The Malaysian government has allocated five million Malaysian ringgit for the Bio-based Accelerator (BBA) program to encourage the development of local companies in the biotechnology industry. Additionally, it announced an allocation of two million Malaysian ringgit to organize the 2023 Malaysian Biotechnology Conference, aimed at attracting more foreign and local investors (Education, 2022).

5. Conclusion:

Based on the findings presented in this study, the following conclusions can be drawn:

- Education and training strategies contribute to improving human capital efficiency.
- The Malaysian state has focused on mechanisms such as technical education, vocational training, and biotechnology to meet the conditions and requirements for a smooth transition to a knowledge economy.
- Proper investment in the components of human capital contributes to activating the requirements for transitioning to a knowledge-based economy.
- Increasing investment in human capital at both macro and micro levels will ensure a smooth and positive transition to a modern economy.

By presenting Malaysia's experience as a distinguished model in human capital investment, several recommendations can be made:

- Algeria should prioritize investment in human capital as an effective strategy and mechanism to address the challenges posed by the knowledge economy.

- Institutions should pay significant attention to human resources due to their effective contributions to creating value and achieving desired goals.

- Algeria should benefit from leading international experiences in human capital investment. It is recommended to emulate Malaysia's experience in this field, given the remarkable results it has achieved.

- The state should focus on attracting national and foreign talent in all institutions of sovereign and sensitive nature, working to develop and enhance their skills through modern educational, formative, and training programs. This will ensure effective interaction with the dimensions of the knowledge economy.

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