Considering Knowledge in Integration: Evidence from the ASEAN Member Nations

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Abstract

The remarkable growth of human knowledge is perhaps the greatest key to achieving what one wants, or what the whole economic society wants. Recognizing knowledge as one of the critical factors for economic advancement in the most multilateral organization in Asia, this study evaluates the indicators which determine the knowledge level of the ASEAN member nations. The study takes a look at factors that are predominant in the countries involved, in terms of general competency, inventions and innovations, and technological advancement. Data relating to high technology exports, human development, research and development, journals, researchers, and patents are taken into consideration to quantify these factors in the assessment of the knowledge level of a country. These indicators are considered significant measures of a country's intellectual standing, emphasizing that one should focus on these measures for the attainment of its advancement in the competitive organization.

Keywords: knowledge, knowledge level, ASEAN, ASEAN member nation

1.0 Introduction

The concept of man's growth and survival has always been dependent on knowledge. From the Stone Age until date, man has struggled to know the unknown. Through a constant quest for intellectual growth, man has developed in different fields including science, technology, arts, and language. The abilities of man to think, rationalize, analyze and memorize enables one to excel. These led to successful and innovative discoveries and inventions and formulation of new ideas and concepts used in man's unending pursuit of knowledge. Knowledge gave man the power and confidence to live a comfortable life and improve the standard of living.

The world has now entered an era where knowledge has become power and learning rapidly and competently has become an overall strategy for success. Through knowledge, man has continuously developed and has been considered as a valuable asset to his community and of the nation as a whole. Every knowledgeable man of a country becomes its strength and gives it a competitive advantage among others. Thus, it can be accepted that knowledge is rapidly becoming equally important to an entire nation as financial wealth, market standing, technological advancements and other substantial assets.

Different countries vary in many ways involving their knowledge resources--- from the quality of education offered, to the various tangible facilities used for the enhancement of pool of knowledge, to the financial resources allocated for such purpose. It then becomes inevitable that the level of knowledge resources of a nation vary and this becomes its establishing

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factor regarding its competitiveness and power. Sir Francis Bacon, the father of deductive reasoning, once said, "Knowledge itself is power." The owner of such captures influence and control among others. That being recognized, all the nations must strive to develop and manage well their knowledge resources to improve their overall standing and provide a better standard of living for its people.

It all starts with man's thirst to know more. It becomes a never-ending process of taking and managing risks, acquiring competition, and reaping returns. Each nation continuously strives to establish an edge among others through proper management of knowledge resources available in each country and effective utilization of such. Davenport (1994) characterizes knowledge management as a procedure of acquiring, allocating, and viably utilizing knowledge. Similarly, Duhon (1998) defines knowledge management as a discipline that promotes an integrated approach to identifying, acquiring, assessing, recovering, and sharing the greater part of an enterprise's data resources. These definitions imply the use of knowledge management in a corporate and organizational point of reference.

This principle of knowledge management has a vast array of applications to different disciplines---from the smallest picture to the broadest one. Take for example in businesses. All businesses have an inventory of knowledge resources in order to develop successfully. Proper management leads to the creation of strategies for the business and the different designs and processes for the production of goods and services. Effective planning and administration of operations also utilizes knowledge. Using the knowledge resources appropriately results in efficient run of the business, as well as a decrease in risks and possible losses.

Taking a wider view, knowledge management as a whole is functional in all the sectors of the economy. This includes those engaged in manufacturing and production, service, technology, as well as primary industries such as agriculture and fishing. It stresses the importance of identifying the knowledge resources in the organizations so that these will be transformed into additional assets of value. In this case, how well an organization manages these knowledge resources brings out innovations, improvements and helps attain excellence in the field. These create an overall advantage to the economy of the nation considered as a whole.

For economist, knowledge is the most important factor of production in a "new economy". Therefore, the production and utilization of such isessential for development (Evers, 2000). Drucker (1990)also stressed out that one of the most valuable economic resources is knowledge. These, being said, it can inferred that knowledge is essential to strengthen the nation in its capabilities to thrive and formulate strategies to ensure larger advancementsandgreater opportunities for its people. As what King and Zeithaml (2003) pointed out, one essential source of competitive advantage and value creationis knowledge. Thus, the attainment of abundant knowledge resources is very critical and essential for the success of a nation in its various endeavors and aim for economic and social growth.

There has been an increased level of competition in the marketplace, high cost associated with human resources, and shortages of basic knowledge. Thesecaused the active quest of making more efficient use of the knowledge and expertise available within the existing work base (Alavi and Leinder, 1999). Thus, managing

intellectual resources promise to deliver sustainable distinctive competencies. These competencies are critical to knowledge-based economies where the application of knowledge becomes the primary source of growth. In this perspective, investments in education, research, innovations and further developmentsare considered as fundamentalvariables. That being said, the framework of knowledge draws significance in developing an economy.

The member nations of the Association of Southeast Asian Nation (ASEAN), namely Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam, share in the vision of development and improvement for the entire ASEAN community. The underlying reason for this integration is to bring about the avenue to establish equitable economic development among the members of the said community. ASEAN is bound to realize integration, stability, competitiveness, and dynamism. Also, the ten countries can freely open the flow of commercial operation, goods, human resources, employment and capital from one country to another. The upcoming ASEAN economic integration is foreseen to unlock opportunities for the citizens of the ten member states. This includes free flow of trade and labor, enabling the exchange of experiences, expertise, and learning from each other based on each nation's pool of knowledge and skill. On the other hand, it is inevitable that competition amongst such integrated nations arises. The country's natural resources, financial and economic stability, and education are some of the factors that bring about this competition. Thus, every nation has a need to assess the level of its advantage considering its knowledge resources through a knowledge index to be able to induce proper attention to aspects which need to be dealt with immediately. It will also help in determining which part of its knowledge management tools and activities needs improvement and better administration.

In a research on a Comprehensive Economic Partnership in East Asia (CEPEA), education systems in ASEAN member nations plus six other countries,namely, China, India, Japan, S Korea, Australia and New Zealand,were examined. It uncovers a blend of generally high performing systems such as Australia, Republic of Korea, Japan, and Singapore. It also revealed systems where substantial improvement may be required such as Cambodia, Lao PDR, and Myanmar. Basing on the educational factor alone, the analysis of the said study provides wider understanding of the reasons why a certain country performs better thananother country in terms of its educational system. Such analysis also provides strong evidence of viable lessons to help advanceperformance of education system. Thus, it is then essential to examine the established policies and strategies in a certain education system, its impact upon its performance, and other considered factors that may slow down or build upsuch established policies (UNESCO,2014).

However, the study mentioned only relates purely to education as a basis for determining the intellectual resources. Thus, a need for additional knowledge indicators arises aimed to measure the knowledge level of a country as a whole, not only to pertain to education. This study aims to determine that will aid in establishing the intellectual standing of the different countries concerned, including analysis of the various factors generated.

2.0 Design and Methods

The procedure utilized as part of this study is known as the exploratory data analysis or data mining. Data mining is a data-analysis method that identifies trends and patterns of a business process (Chao, 2006). Data mining is a rapidly developing trend in data administration. It has turned into a well-known apparatus for managers, analysts and experts in business and government associations. It is used in the course of provoking obscure, substantial and noteworthy data from a mixed bag of databases and hence using the data to settle on vital business decisions.

Based on the concept of the determinants of the level of knowledge resources of a country, the following variables are considered; (1) Journals, (2) High Technology Imports, (3) Percent of Researchers, (4) Patent Applications, (5) Research and Development Expenditure and (6) Human Development Index. Such were derived from credible and reliable sources. Also, The Association of Southeast Asian Nation members were drawn.

1. Journals- theserefer to scientific and engineering articles published in the various fields. These include physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences (http://data.worldbank.org/indicator/IP.JRN.ARTC.SC). For purposes of this study, the researchers utilized the number of scientific and technical journal articles as of 2011, the latest data available.
2. High Tech Exports- these refer to products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery (http://data.worldbank.org/indicator/TX.VAL.TECH.CD). The data used in this study is the percentage of the manufactured exports per country as of 2013 which is the latest available data.
3. Researchers- they are professionals who are engaged in the conception and creation of new knowledge,processes, products, methods and systems. They are also those who are directly involved in the management of projects for such purposes (http://www.oecd-ilibrary.org). The data used represent the percentage of researchers per million people per country. The data utilized is the latest available data of each country ranging from years 2011-2012.
4. Patent Applications- this refers to a request submitted by an inventor for agrantto be the sole owner of an idea or invention's patent (http://www.businessdictionary.com/). The data used by the researchers is the total number of patent applications of each country in the latest available year, 2013.
5. R and D Expenditures- these are current and capital expenditures on creative work undertaken systematically with the goal of increasing knowledge. These include knowledge of humanity, culture, and society, and the use of knowledge for new applications (http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS). The data used in this study is the latest data available for the specific country, ranging from 2002-2012. The value represents the percentage of Gross Domestic Product for each country.

6. Human Development Index – The Human Development Index (HDI) is a statistical tool used to measure a country's overall achievement in its social and economic dimensions.(http://economictimes.indiatimes.com/definition/human-development-index). The latest available data is for the year 2013, and such was utilized by the researchers.

Data recovery was physically done by searching numerous reliable world measurements sources. The gathered information was then aggregated to demonstrate the indicators versus the ASEAN member country that it relates.

The produced variables were at first subjected to factor analysis to recognize indicators that are regarded to show a high relationship. Indices were then registered to determine the nation that shows predominance over the others in the components perceived. The principal components analysis was utilized in the determination of the indices and in the processing of the general index record that will characterize the positioning of the ASEAN countries. The knowledge level of a particular country can then be resolved in view of the records registered.

3.0 Results and Discussion

It is necessary that the indicators specified above be inspected in connection with the ASEAN member country that possesses it. Table 1 below shows the ASEAN member nations together with their respective indicators: Journals, High Technology Exports, Researchers, Patent Applications, R and D Expenditures, and Human Development Index (HDI).

Table 1: Knowledge Level Indicators

Country	Journals	High Technology Exports	Researchers	Patent Applications	R&D Exp.	HDI
Brunei	15	15.2	0.0286		0.04	0.85
Cambodia	33	0.2	0.0017	1	0.05	0.58
Indonesia	270	7.1	0.0205	663	0.08	0.68
Lao PDR	21		0.0016		0.04	0.57
Malaysia	2092	43.5	0.1643	1199	1.07	0.77
Myanmar	9	0	0.0018		0.16	0.52
Philippines	241	47.1	0.0081	220	0.11	0.66
Singapore	4543	47	0.6438	1143	2.10	0.90
Thailand	2304	20.1	0.0315	1572	0.21	0.72
Vietnam	432	28.2	0.0115	443	0.19	0.64

The data on journals represent the latest number of scientific and technical articles produced by each particular member nation. Singapore has the highest number of publications while Myanmar has the lowest number. High technology export is a percentage based on manufactured exports per country. Philippines has the most number of such followed by Singapore. However, there is no available data for Lao PDR. Shown in the researchers column is the percentage of the

total number of researchers per million people per country. Singapore again registered the highest rate and Myanmar having the lowest. The patent applications refer to the number of applications pending in their respective patent offices, with Thailand having the most number. However, due to some data scarcity, the researchers could not find the number of patents applications for Brunei, Lao PDR, and Myanmar. The R and D Expenditure shown is the percentage based on the GDP per country, with Singapore having the highest rate and both Brunei and Lao PDR having the lowest. As shown in the table, Singapore has the highest HDI while Myanmar has the lowest. The data presented are the latest ones available from reliable sources.

Based on the data presented in Table 1, factor analysis was then performed. This strategy is done with a particular end goal of gathering together variables that display a high correlation, adequately decreasing the quantity of factors to be considered.Table 2 below shows the result of the said factor analysis.

Table 2: Unrotated Factor Loadings and Communalities

Variable	Factor 1	Factor 2	Factor 3	Communality
Journals	0.971	0.161	(0.083)	0.976
High Tech Exports	0.673	(0.487)	0.556	0.999
Researchers	0.924	(0.190)	(0.326)	0.996
Patent Applications	0.696	0.658	0.287	0.999
R&D Exp.	0.955	(0.176)	(0.195)	0.981
HDI	0.987	0.058	(0.006)	0.977
Variance	4.6200	0.7664	0.5417	5.9282
% Var	0.770	0.128	0.090	0.988

As shown in Table 2, the six indicators initially examined are now grouped into three distinct factors. Factor 1 shows high factor loadings on all variables. It should be noted that these six variables refer to the different knowledge measurements mainly possessed by a country. Thus, the researchers wish to refer to this as the "general competency" of a nation.

The second factor shows high factor loading in only one variable, which is the patent applications. The knowledge level of a nation may be indicated by the research and development activities done by a country for its progress and advancement. It can be evidenced by the inventions created and patented. The researchers refer this as "inventions and innovations index".

The variable High Technology Exports has the highest factor loading on the last factor. This variable relates to the products with high Research and Development intensity, with the application of the advancements made in the concept of technology. The researchers chose to name this factor as "technological advancement". Furthermore, the results of the factor analysis reveal that 98.8% of the knowledge level of a nation is explained by the factors of general competency, inventions and innovations index, and technological advancement. In summary, then, the following indicators are considered, and their respective dominant factors are shown, as follows:

Table 3: Knowledge Level Indicators and Factor

Factor	Indicators
General Competency	Journals, High Tech Exports, Researchers, Patent Applications, R&D Exp., HDI
Inventions and Innovations	Patent Applications
Technological Advancement	High Tech Exports

Taking into consideration the factors identified, the researchers proceeded to determine the indices through the use of principal components analysis.The succeeding table presents the General Competency Index (GCI) of the ASEAN countries, utilizing the following data:

Eigenvalue	2963572	132205	259	0	0	0
Proportion	0.957	0.043	0.000	0.000	0.000	0.000
Cumulative	0.957	1.000	1.000	1.000	1.000	1.000

Variable	PC1	PC2	PC3	PC4	PC5	PC6
Journals	0.965	-0.264	-0.008	0.001	0.000	-0.000
High tech exports	0.006	-0.009	1.000	0.005	-0.001	0.001
Researchers (%)	0.000	-0.000	0.000	-0.176	-0.833	0.524
Patent Applications	0.264	0.965	0.007	-0.001	-0.000	0.000
R&D Exp.	0.000	-0.001	0.005	-0.980	0.197	-0.016
HDI	0.000	-0.000	0.001	-0.090	-0.516	-0.852

From which, the formula in computing GCI and the results are as follows:

$$\text{GCI Raw Score} = \frac{0.965J+0.006HTE+0.0001Re+0.264PA+0.0001RD+0.0001HDI}{1.235}$$

Equation 1: GCI Raw Score

$$\text{GCI} = \frac{\text{GCI Raw Score}}{\text{Maximum GCI Raw Score}}$$

Equation 2: General Competency Index

Based on Equations 1 and 2, Table 4 shows the general competency index of the ASEAN member nations.

Table 4: General Competency Index for ASEAN Countries

	Journals	High Tech Exports	Researchers	Patent Applications	R&D Exp.	HDI	Raw Score	GCI	Rank
Brunei	11.7178	0.07383	0.000002	0	0.000003	0.000069	11.7917	0.0031	9
Cambodia	25.7792	0.00097	0.000000	0	0.000004	0.000047	25.9939	0.0069	7
Indonesia	210.9204	0.03449	0.000002	142	0.000006	0.000055	352.6469	0.093	5
Lao PDR	16.4049		0.000000	0	0.000003	0.000046	16.4050	0.0043	8
Malaysia	1634.2427	0.21128	0.000013	256	0.000087	0.000063	1890.6963	0.4984	3
Myanmar	7.0307		0.000000	0	0.000013	0.000042	7.0307	0.0019	10
Philippines	188.2660	0.22877	0.000001	47	0.000009	0.000053	235.5118	0.0621	6
Singapore	3548.9314	0.22828	0.000052	244	0.000170	0.000073	3793.4343	1	1
Thailand	1799.8543	0.09763	0.000003	336	0.000017	0.000058	2135.9092	0.5631	2
Vietnam	337.4727	0.13697	0.000001	95	0.000015	0.000052	432.2847	0.114	4

The country with the highest General Competency Index is Singapore and the lowest is Myanmar. This result is indicative of the fact that Singapore is already a well-known developed country and is one of the most competitive cities in the world based on the Global Competitiveness Report in 2014-2015.

Inventions and innovations of the country would also tell the knowledge level of such country. In computing the Inventions and Innovations Index, the specific number of patent applications of a country is compared to the total number patent applications among ASEAN member nations. The raw score for inventions and innovations is then divided by the maximum of the raw scores in order to arrive at the Inventions and Innovations Index.

Table 5: Inventions and Innovations Index among ASEAN Countries

Country	Patent Applications	Raw Score	III	Rank
Brunei			0	8
Cambodia	1	0.0001908	0.00064	7
Indonesia	663	0.1265026	0.42176	4
Lao PDR			0	8
Malaysia	1199	0.2287731	0.76272	2
Myanmar			0	8
Philippines	220	0.0419767	0.13995	6
Singapore	1143	0.2180882	0.7271	3
Thailand	1572	0.2999428	1	1
Vietnam	443	0.0845259	0.28181	5

Taking into account that Thailand is known for its creativity and has been recognized for innovations and inventions that benefit the country. In International Exhibition of Inventions of Geneva held last 2014, Thailand contestants won over50 medals for their inventions.Thus, it is not surprising that the country ranked the highest in terms of inventions and innovation index. In fact, the state organizes an Inventor's Day every year in order to promote new inventions and innovations that generate new benefits in the fields of science, technology, and the environment. It is expected that these inventions and innovations will result in economic and social development of the country(National Research Council of Thailand).

In the advanced world nowadays, technology plays an essential role in the lives of the people. Like in the previous index, the third factor has only one component. Thus, the data for high tech exports of a country is compared to the total among ASEAN member nations. The raw score is then divided by the maximum of the raw scores in order to arrive at the Technological Advancement Index.

Table 6: Technological Advancement Index among ASEAN Countries

Country	High Tech Exports	Raw Score	TAI	Rank
Brunei	15.2	0.07293666	0.32272	6
Cambodia	0.2	0.00095969	0.00425	8
Indonesia	7.1	0.0340691	0.15074	7
Lao PDR		0	0	9
Malaysia	43.5	0.20873321	0.92357	3
Myanmar	0	0	0	9
Philippines	47.1	0.22600768	1	1
Singapore	47	0.22552783	0.99788	2
Thailand	20.1	0.09644914	0.42675	5
Vietnam	28.2	0.1353167	0.59873	4

In terms of technological advancements, Philippines ranked first. This can be inferred by the fact that the Philippines has been making a significant leap to global development. Since the high technology products that lead Philippine exports is already a fast-growing segment of the international trade, this becomes a strong evidence of the country's development. Related studies show that the Philippinesis now more 'high-tech' than those countries which arelonger-established and larger exporters of electronicssuch as Malaysia and Singapore (QEH Working Paper Number 49 Export Performance and Competitiveness in the Philippines). Aside from the countries being involved in globalization, it is also intensely engaged in information and communication technology trade.

To sum up the indices which would portray the knowledge level of a nation, the researchers further used Principal Component Analysis to compute for the ASEAN Nation Knowledge Level Index (ANKLI). It considersgeneral competence index, inventions and innovation index, and technological advancement index. The data weight assignments

resulting from the principal components analysis and the equations pertinent to the computation of the ANKLI are presented below.

Eigenanalysis of the Covariance Matrix

Eigenvalue	0.33140	0.08031	0.01880
Proportion	0.770	0.187	0.044
Cumulative	0.770	0.956	1.000

Variable	PC1	PC2	PC3
GCI	0.541	-0.291	0.789
III	0.577	-0.554	-0.600
TAI	0.612	0.780	-0.132

$$\text{ANKLI Raw Score} = \frac{0.541GCI + 0.577III + 0.612TAI}{1.73}$$

Equation 7: ANKLI Raw Score

$$\text{ANKLI} = \frac{\text{ANKLI Raw Score}}{\text{Maximum ANKLI Raw Score}}$$

Equation 8: ASEAN Nation Knowledge Level Index (ANKLI)

It should be noted that all the three factors take an almost equal part in the determination of the ANKLI. Table 7 presents a summary of the ANKLI among ASEAN nations, together with its ranking.

Table 7: ASEAN Nation Knowledge Level Index (ANKLI) and the corresponding rank

Country	General Competency Index	Inventions and Innovations Index	Technological Advancement Index	Raw Score	ANKLI	Rank
Brunei	0.00097206	0	0.11416	0.11514	0.12677	7
Cambodia	0.00214284	0.000212167	0.00150	0.00386	0.00425	8
Indonesia	0.02907091	0.140666505	0.05333	0.22306	0.24560	6
Lao PDR	0.00135237	0	0.00000	0.00135	0.00149	9
Malaysia	0.15586205	0.254387842	0.32672	0.73697	0.81143	2
Myanmar	0.00057959	0	0.00000	0.00058	0.00064	10
Philippines	0.01941472	0.046676668	0.35376	0.41985	0.46227	4
Singapore	0.31271676	0.242506508	0.35301	0.90823	1.00000	1
Thailand	0.1760765	0.333526012	0.15097	0.66057	0.72732	3
Vietnam	0.03563596	0.093989837	0.21180	0.34143	0.37593	5

As per ranking, Singapore is the most knowledgeable country among the ASEAN member nations. This is in line with the fact that the country is the second most competitive city in the world. The country's competitiveness is armoured by world-class infrastructuresand excellent transportation facilities. Moreover,the country'ssolid focus on education provides personnel with the skills needed for a rapidly changing global economy (Global Competitiveness Report 2014 – 2015, World Economic Forum). Accordingly, Singapore ranks 2nd in the quality of the educational system it provides. Among the universities worldwide, The National University of Singapore is 29marks lower from the outstanding European universities.

The above results show that each ASEAN member nation has its distinct level of knowledge index. It could also be utilized to look at which factor a particular member may focus to improve its knowledge level index. For instance, Myanmar always ranks the lowest in all the three factors. This result could alert the country to make a move of how to increase the level of that particular factor, with regards also to its component, and thereby increasing the knowledge level index as a whole.

In addition, the researchers extracted the top three nations in terms of the three factors mentioned. The table below shows this:

Table 8: Top Three Countries per Index

Rank	General Competency	Inventions and Innovations	Technological Advancement	ANKLI
1	Singapore	Thailand	Philippines	Singapore
2	Thailand	Malaysia	Singapore	Malaysia
3	Malaysia	Singapore	Malaysia	Thailand

As shown in Table 8, in all three indices, it is always Singapore, Thailand, and Malaysia vying for the top 3 spots except in Technological Advancement where the Philippines ranked first. This shows that these 3 countries (Singapore, Thailand, and Malaysia) are already established in the Southeast Asia in terms of their capability to grow and compete and are on top in terms of successful management of their knowledge resources. As for the Philippines, this also indicates its great potentials to develop and become more advanced country. Also,considering that it ranks first, the need for more major export industries for the Philippines have to be addressed to be able to promote more rapid growth for the country and increase its overall competitiveness.

Moreover, in order to ascertain the grouping of countries according to some similar characteristic as determined and quantified by statistical distance from a centroid, multivariate cluster analysis was then performed. Theresults of the cluster analysis are presented in Table 9.

Table 9: Cluster Analysis of Observations

Variable	Cluster 1	Cluster 2	Cluster 3	Grand Centroid
General Competency Index	0.012738	0.165969	0.312720	0.073382
Inventions and Innovations Index	0.040221	0.293957	0.242510	0.111197
Technological Advancement Index	0.104936	0.238842	0.353010	0.156524
ANKLI	0.173850	0.769375	1.000000	0.375570

Cluster 1 is comprised of Brunei Darussalam, Cambodia, Lao PDR, Myanmar, Vietnam, Philippines and Indonesia. Cluster 2 is composed of Thailand and Malaysia. Cluster 3 is composed solely of Singapore. As observed in the table, Cluster 1 registered the lowest in all factors considered, including the ASEAN Nation Knowledge Level Index. Cluster 1 should focus on increasing their indices to improve their total KLI. It also involves proper management of their knowledge resources and formulation of more strategies to appropriately utilize these resources. Cluster 2 registers the top 2 highest in Inventions and Innovations Index which is determined primarily by patent applications. Patents are legal ways to protect the inventions of a particular country. It promotes innovations and encourages economic development and is designed to disseminate knowledge and information to the public. Thus, the country in Cluster 2 should see to it that their inventions are well protected and safeguarded. Cluster 3 composed of Singapore occupies its cluster considering that it leads the ASEAN member nations in terms of overall ranking in the Knowledge Index.

4.0 Conclusion

Knowledge has been considered a great determinant of global competence and power. It is important for a country to have enough knowledge resources and employ proper knowledge management for such. It is also to ensure its standing on the overall global ranking.

This paper has identified three factors thatprimarily determine the knowledge level of a country. It has been demonstrated that the indicators used to measure a country's intellectual performance may be clustered to represent three distinct factors that serve to label a country's knowledge index. In the case of the ASEAN member nations, certain states have alreadyproven the results to themselves. Take for example Singapore- it has registered a lead in the general competency index that is represented by all the indicators. The country also always makes it to the top three in terms of the other two indices. These factors have been contributory in shooting Singapore to rank number 1 among all member nations. On the other hand, the result of the individual indices can give an interesting idea to look into. For example, considering that Thailand registers relatively high inventions and innovations index, thus it could be said that the knowledge pool of a country is measured and represented by the improvements such country has made. It could also be observed that in terms of technological advancement, Philippines has outranked the other member nations. Thus, the knowledge level of the country may be attributed to its conception of products with the aid of technology.

In relation with this, it could also be noticed that the knowledge pool of the country is measured beyond the traditional literacy rates and educational aspect. Knowledge can also be measured with regards to the country's contributions to different fields of knowledge such as science and technology and its various end products that include inventions and innovations made. The overall human development is also recognized because of its contribution to country's overall economic and social development.

There is a variation in the knowledge level of each country considering that the strategies employed and the factors focused vary. However, an examination of the factors that influence a nation's knowledge level would allow a strategic

approach to policy making. It also ensures the focus on areas that have more weight in the determination of the said knowledge level. It can be observed that the factor that has the highest weight is Technological Advancement. In a period of advanced technological discoveries and applications, it is considered essential for a country to focus on acquiring technological knowledge and updates. It is to ensure the country's competence in the said knowledge factor. However, it could also be seen that the three indices- general competency, inventions and innovations, and technological advancement index- has almost equally contributed to the ASEAN Knowledge Level Index. It means that the countries concerned may endeavor to focus on these three indices together with its individual components. Each country must strive to work continuouslyon its strength and improve the other indices that demonstrated a small level of percentage in the determination of its knowledge level.

As knowledge becomes increasingly important, countries must have an identifying edge in terms of its capability to acquire and maximize the use of its knowledge resources to help it in its unending aim for growth and development. Considering that knowledge will continuously evolve, each country must learn to improve these resources in all areas possible- may it be in the educational aspect alone or considering a broader scope of knowledge.

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