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Scrutinizing the Trends and Indexes of the Knowledge Economy in the Kingdom of Saudi Arabia

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Abstract
This study focusses on the concepts of significance to the knowledge economy and its characteristics in the Kingdom of Saudi Arabia. Qualitative and quantitative research methodology design has been incorporated to validate the study. The outcome of the study exhibited that the Kingdom of Saudi Arabia has achieved progress according to the research and development index. The rate of expenditure as a ratio from the Gross Domestic Product is still negligent and modest in comparison with the international expenditure rates. It has been recommended to adopt an effective mechanism for the consolidation of the relations between the scientific research institutions and the productive and service sectors.

Keywords: Knowledge economy, digital economy, human development, information technology, Kingdom of Saudi Arabia.

1. Introduction

Knowledge is considered as one of the significant attainments of the economy and the society alike, as it represents the basic distinctive characteristic of the human society. Several states had paid attention to the subject of the knowledge economy, because it undertakes the dissemination of production and employment of knowledge in all fields of societal activity, and hence, it works towards the development of the individual and increasing the capabilities. Therefore, many countries resorted to different models for the development of their economies through the use of the means of science and technology, and in that manner, the knowledge economy became an important sector. One of the branches of the economic science, based on a more profound understanding of the role of increasing knowledge and the human capital in the development of the economy and the progress of the society, have been discussed. In addition to that, knowledge economy is considered as the primary mover of the economic competition by adding enormous values to the economic products, through the increase of productivity and demand on the new technologies and ideas which have accompanied revolutionary changes in both of the markets and sectors. The government of Saudi Arabia has associated the development of a knowledge economy with increasing innovative output from that society (Alothman & Busch, 2009, p.15). Although, knowledge has been studied at the inter-firm and intra-firm level, the association of the level of knowledge in the wider community with the innovativeness of firms is not clear (Rivkin, 2001, pp.274-293).

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The Arab societies are facing great challenges for the sake of the firm establishment of both the economic and social development efforts, perhaps among the most important challenges is the capability for the investment of the immense potentialities and human capacities, which exist in the Arab State. According to the economies of the states of the Gulf Cooperation Council, it has been found, that they are still characterized as 'rent economies'. Although, they take modern positions according to the knowledge economy guide, and they are the best in comparison with the remaining Arab States, the very thing which requires the undertaking of radical changes in the economic, political and legal structures with the purpose of the transformation to the knowledge economy which is based on an effective system of education, economic incentives and the governance.

2. The Structural Features of Saudi Arabia

The prominence of oil in the Saudi Arabia's government revenue, foreign exchange earnings, and as a source of growth of national income, is the most common feature of the economic system. The development process of the country has prominently been commenced to the policies which would expand the economy and enhance the standards of living of the population within the region. An overall scenario of the industry of oil in Saudi Arabia today, can be best observed by examining the present demand and supply trends (El Mallakh et al, 2015). Saudi Arabia has been underperformed about the level of GDP; it has not only fallen behind on the innovation and education in International terms. However, Saudi Arabia has been affected as a result of the abundance of oil and gas income. In exploring the Saudi Arabia's plan of increasing a Knowledge Economy, and the depressing presentation on the evaluation of information and education, this study analyzed the tertiary, primary and secondary educational systems in the regions. It has been established, that current educational systems do not organize the students effectively to engage actively or practice further studies in a Knowledge Economy; this need talent related to analysis, critical thinking, and ownership of processes, active learning, and innovative drive (Hvidt M, 2013).

2.1 The Problem of the Study

The development and advancement of the human element are considered among the important pillars upon which the knowledge economy and society is based. Therefore, the genuine development is not that development which is based only on the financial resources; rather it is based on the discussion of the individual, the efficient and inexhaustible economic resource. Hence, the problem relies on how to prepare the human resources which are characterized with high knowledge and skills capacities, and how to provide the promising digital environment for the transformation of a knowledge economy. The core of the problem of this study is formed in the answer to the following question:

Is the human, physical, technological and environmental resources in the Kingdom of Saudi Arabia characterized with adequate high knowledge and skills capacitive for the transformation into a knowledge economy?

2.2 The Importance of the Study

The world is witnessing during the present millennium, a knowledge revolution, as the global economy currently is heading more and more towards the knowledge economy which depends on the use of the information technology, as the knowledge economy contributes with more than (50%) of the American Gross National Income. Saudi Arabia has proved to be an extremely attractive business opportunity for companies in all sectors (Habibullah, 2014).

Therefore, governments had managed to move the gradual transition to what was dubbed, the knowledge economy with the purpose of arriving at the more advanced services, nevertheless, it is found that the human element is the nucleus for all that is happening of advancement, modernization, and development in the government and private corporations. Hence, an individual should be prepared, educated, improved and developed in elements of knowledge. Likewise, it has been found, that no separation can be made between the scientific and technological program and the process of evolution and progress. Therefore, the states which achieve the highest rates of economic growth are the ones who possess a more advanced informatics structure, and this is attributed to several considerations such as the link of the worker's productivity in all the fields of work of the economic activity with the available scientific and technological progress thereto. Besides, the importance of the scientific research and the technological development in the increase and improvement of the productivity of resources is rising. The Kingdom of Saudi Arabia is one state, whose government has identified that increasing innovation is required to meet the strategic economic goals of the government (Aulawi et al, 2009, pp.2238-2246).

The Kingdom of Saudi Arabia is facing great challenges ensuing from wide technological gap represented in the weakness of its productive channels, which renders its products facing significant competition in the international markets, and accordingly this gap is negatively reflected in the programs of economic and social development therein. Hence, the importance of this research rested in the necessity of paying attention to the knowledge economy, which qualifies the sate to be elevated to its outstanding status among the advanced states. In addition to that, the significance of the research stems also from the need to get acquaintance with the causes and effects of this technological gap, and the means to address them to enable the Kingdom to cope with the international changes in this context and to move from a mere society; which consumes the products of others to a producer of such commodities and to aspire to compete within the international commercial exchange.

2.3 The Objectives of the Study

The primary purpose of the study is to investigate and analyze the trends and indexes of the knowledge economy in the Kingdom of Saudi Arabia, from which several sub-objectives emanate and it may have summaries then as follows:

1. To highlight some concepts of relevance to the knowledge economy.

2. To get acquaintance with the importance of the knowledge economy and its characteristics, besides elucidating the impact of the knowledge economy on the development of the societies.
3. To know the abilities of the Kingdom of Saudi Arabia, according to the requirements and indexes of the knowledge economy and the mechanisms of transformation to the knowledge economy, according to the strategy of the Kingdom of Saudi Arabia.

3. Method

The descriptive/ analytic/ applied method will be adopted in this study, as the theoretical/ descriptive method; that will enable the researcher to highlight the significant concepts of the knowledge economy. The quantitative analysis has also been used to find the effect of the unemployment rate and human development index on per capita share from the Gross Domestic Product (GDP). As to the analytic applied method, it will be adopted to analyze the behaviour of the indexes of the knowledge economy in the Kingdom of Saudi Arabia, by using the World Bank method which is known as knowledge measurement methodology (KAM). The KAM includes eighty-three (83) indexes divided on four (4) pillars to measure the performance of one hundred and forty (140) states of the world in the field of knowledge economy, with a measurement ranging from the zero (0) degree to ten degrees (10) in such a manner, that whenever the index came nearer to ten (10), then this will mean an evidence for a high level of knowledge economy and vice versa.

4. Results and Discussion

The regression analysis has been applied on the level of economic and human development in the Gulf States, to observe the effect of GDP and human development index on the rate of unemployment. By using SPSS, it has been analyzed, that the results found are statistically non-significant. The rate of unemployment has been taken as the dependent variable, whereas the GDP and the human development index have been taken as the independent variable.

Hypothesis (1)

H_0: There is no significant effect of GDP on the rate of unemployment

H_A: There is a significant effect of GDP on the rate of unemployment

Hypothesis (2)

H_0: There is no significant effect of human development on the rate of unemployment

H_A: There is significant effect of human development on the rate of unemployment

It has been observed from the results, that the p-value of GDP found to be 0.674, which is less than the level of significance (α=0.05). It means that, the study fails to reject the null hypothesis and concludes that there is no significant effect of GDP on the rate of

unemployment. The effect of human development index on the rate of unemployment has also been found statistically non-significant, as the p-value of the independent variable 'human development index' has been observed 0.224, which is greater than the level of significance (α=0.05). Thus, the study fails to reject the null hypothesis and concluded that there has been no significant effect of human development on the rate of unemployment.

Table 1: Regression Analysis of the level of Economic and Human Development in the Gulf States

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.593[a]	.351	.027	2.146704

a. Predictors: (Constant), human_development, GDP

ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.975	2	4.988	1.082	.421[b]
	Residual	18.433	4	4.608		
	Total	28.409	6			

a. Dependent Variable: unemployment

b. Predictors: (Constant), human_development, GDP

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-49.197	36.565		-1.345	.250
	GDP	-0.0000109	.000	-.183	-.453	.674
	human_development	65.070	45.302	.581	1.436	.224

a. Dependent Variable: unemployment

5. Previous Studies

It has been considered from past studies, that the development of the labour force in the Kingdom of Saudi Arabia has a significant importance on the comprehensive development, specially it has been suffering from an acute deficiency in the national labour at all levels, and this represented a great constraint to the comprehensive development. The study also informed that the development of the human resources engenders a productive and lucrative national industry, which in return will revert to the Saudi Society. The study found that, the growth of the Saudi labour depends on several factors and among them is the rate of the demographic growth and their structure in the kingdom, besides the rate of births and deaths; in addition to that the development of the human resources depends on the progress of public, technical and vocational education. Likewise, the raising of the productivity of the Saudi employees will be assumed through the effective training, which will ensure the availability of the modern information and technologies. Saudi Arabia's participation in the World Trade Organisation is a clear indication that it

wishes to be a major participant to the other economies (Alkhathlan et al, 2014, pp.209-225).

A study has been conducted entitled: "The role of the knowledge economy in the preparation of the human resources to face the requirements of sustainable development in Jordon", as the study aimed at revealing the role which has been undertaken by the knowledge economy in the preparation of the human resources, to encounter the requirements of sustainable development in Jordon. The sample of the study consisted of (350) educators and (8) experts in the Center for Human Resources Development. The study found, that the human resources impose requirements on the educational system such as the reconsideration of the educational and instructional curricula, programs, and policies in a continuous manner, in addition to the expansion of the use of the information technology. The findings of the study showed some challenges, which are being faced by the sustainable development in the age of knowledge economy which are manifested in the human's economy, social and administrative challenges, such as poverty, unemployment, the capacity for adaptation and cultural assimilation, in addition to the environment, energy and water problems. The Kingdom of Saudi Arabia is one state whose government has identified, that increasing innovation is required to meet the strategic economic goals of the government (Aulawi et al, 2009, pp.2238-2246).

Another study had been conducted entitled: "The impact of the improvement of the health and education services on the human development in the Sultanate of Oman". The study aimed at monitoring the improvement and analysis of the reality of the health and education services, since the onset of the renaissance. Besides the elucidation of the extent of impact on educational and health sectors and the income on raising the efficiency of the individual in the society; and to highlight the challenges and difficulties which encounter the human development in the Sultanate of Oman. Among the important recommendations, one of them was to undertake the increase of the investment expenditure on the expansion of the modern and technological education, linking education with the labour market, provision of integrated scientific and practical environments and spread of the training centres in all the corporations, which are affiliated to the province of the Sultanate. Promising economic growth & extremely favourable corporate tax rates make Saudi Arabia an appealing business ventures to many U.S. companies (Anderson, 2014, pp.1933-1950; Rahman, 2014).

The study had been prepared, which focused on reality of the knowledge economy in the Arab Countries, with emphasis on the case of the Gulf Cooperation Council as a model, through the broaching of the conceptual and the theoretical framework related to the knowledge economy, and arriving at an evaluative and descriptive reading of the state of the knowledge economy in the Arab states. In general, the analyses of the indexes of the knowledge economy, in the states of the Gulf Cooperation Council, which are based on the basis of a package of determinants, have also been discussed. The researcher concluded that it is incumbent to enforce the deepening of the economic and administrative reform, activation of the efforts for the consolidation of the capabilities of the knowledge economy, through the transfer and acclimatization of the knowledge. The concentrated investment in the most recent and up-dated technologies, construction of the infrastructure in a manner which will encourage investment and growth, laying down the most up-dated standard measures for management, performance and quality and

focusing on the big strategic projects, in addition to the encouragement of the honest competition and development of the human resources depending on the high competence and professionalism. Currently, Saudi Arabia is facing problems such as unemployment, and migration issues as well as concerns with the depletion of water supply, the strain of having to provide food for its increasingly large population and their dependency on oil prices and output (Patterson, 2013).

The study conducted on the possibility of the transformation of the knowledge-based economy, in the Arab states. The study relied on data from several official sources such as the World Bank, human resources reports, and others. The study attempted to give answers to the following questions: what is the significance of the transformation to the knowledge-based economy for the Arab states? The study relied on data from several official sources such as the World Bank, human resources reports, and others. The study attempted to give answers to the following questions: What is the significance of the transformation to the knowledge-based economy for the Arab states? And what are the necessary policies and procedures for the transformation of the knowledge-based economy in the Arab states? Through the use of the descriptive/ analytical method, the researcher found, that there is a weakness and slowness in the indexes of the transformation to the knowledge-based economy in the Arab states, as a whole, and that there is a difference between the Arab states pertaining to their preparedness for the transformation to the knowledge-based economy. For instance, it is found that the states of Qatar and the United Arab Emirates are more advanced in many indexes in comparison with the Arab states. The study recommended the necessity of paying attention to the progress, development, knowledge and to benefit from the information technology and communications, so as to arrive at the construction of the knowledge economy in those states. However, the government is promoting foreign investment in the Kingdom. The government have also focused on the promising growth factor of the economy in Saudi Arabia as well as the favourable corporate tax level, and the ability to move/export products to surrounding nations with Saudi Arabia's road, rail, and ports (Shoult, 2006).

Saudi Arabia is probably posing the most difficulties for a revolt since King Abdullah has made major changes to education, and has moved towards more equality for women. He has also established a more favourable atmosphere for foreign investment and connection with the world by becoming a member of the WTO (Matthiesen, 2013). These persistent upsets and violence in the region could adversely affect the stability of Saudi Arabia; however, the kingdom is making great strides to breach the socio-economic gap that it was left by its former ruler (Blanchard, 2010).

6. The Emergence of the Knowledge Economy

Historians has linked the evolution of the human society with three main stages, which were constituted by the occurrence of three leading revolutions, beginning with the "agricultural revolution", towards the "industrial revolution" and hence, the knowledge considering it as the basis of the "knowledge revolution" or what is known as the third transformation. The following table sum-up the most salient traits which characterized each stage, through the illustration of the value producer work nature and through the presentation of the bilateral partnership between the individuals and the most pairing

element of production thereto; in addition, to the highlighting of the most important tools of production which are used during each epoch.

Table 2: Characteristics of the Information Age and the Ages which preceded it

The age	Agriculture	Industry	Information
Time period	Pre 1800	1800 – 1957	1957 – up to date
Nature of the labourers	Farmers	Factory works	Those employed knowledge
Partnership	Individual/ land	Individual/ machine	Individuals/ individuals

Source: *'Emad Abdelwahab Sabbagh, the science of information: the culture house for publishing and distribution' Amman, Jordan, 1998, P. 40.*

7. The Concept of Knowledge Economy

The knowledge economy is considered as a new branch of the economic sciences in the recent times. As mentioned earlier than, several appellations were given to indicate the knowledge economy. Therefore, several views were mentioned about the concept of the knowledge economy, as some consider it as the economy which deals with the obtainment of knowledge, participating in it and its investment with the purpose of improving the quality of life in its entire fields. Others think that, it concerns the engendering of a group of strategic changes like the economic surrounding and to regulate it, so as it become much more harmonious with the challenges of the globalization, communications and the sustainable development of its comprehensive concept. Some of Saudi Arabia's major strengths come from a growing economy by offering a great influx of religious pilgrims, being a member of a well established organization such as the WTO, and having great ground works with infrastructure that makes up some of the major strengths of Saudi Arabia (Brown & LACEY, 2009).

Others define the knowledge economy, as the study and understanding of the knowledge accumulation process and the individual motivations to discover the learning of knowledge and to obtain what was known by the others. Some also defines as "the knowledge economy includes the intensive use of knowledge, in undertaking of the economic activities and their expansion and development Competition in the food and beverage industries is welcomed in Saudi Arabia". Since, they already consume 45% of the all the feed barely traded in global markets (El Mallakh, 2015). From the aforementioned, it becomes evident, that the knowledge economy represents the infrastructure of the technology and the increasing transformation through the use of knowledge and it is not a concept of domination of industrialization (Drummond, 2002).

7.1 The Importance of the Knowledge Economy

Knowledge economy helps in the dissemination of knowledge, its employment, production and creation of new jobs. It also contributes to the improvement of the performance, rising of the productivity and reduction of the costs of production, through the use of the advanced technological means and techniques which are included in the

knowledge economy. The knowledge economy is also characterized by the great increase of knowledge added value ratio, as the knowledge commodities occupy the first place among the various other commodities, which will assist in the growth of the economy.

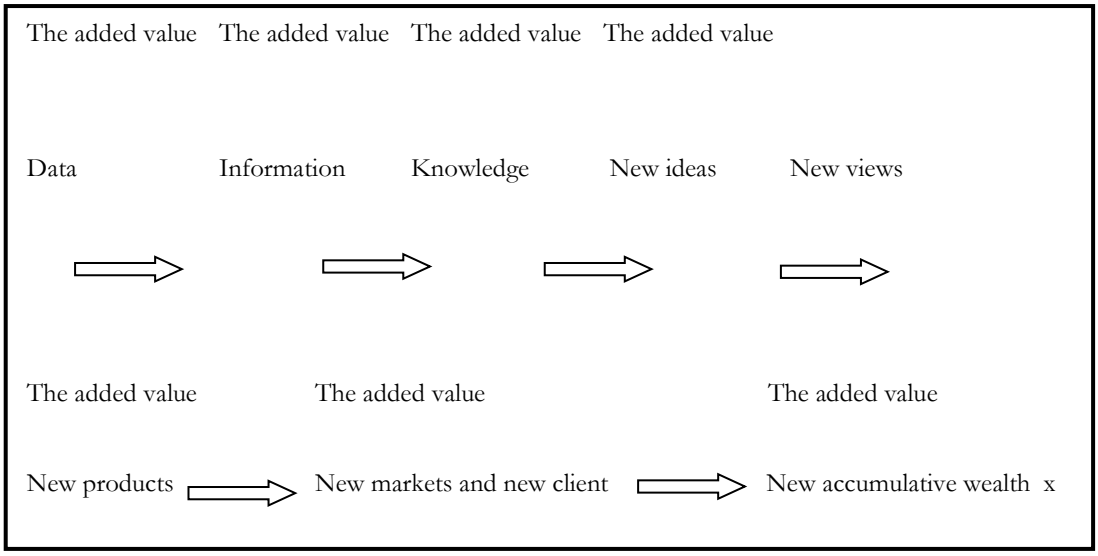

Figure 1: The Inputs of the Added Value of the Knowledge Economy.
Source: Al-Khudhirey Muhsin, 2001, P. 4

7.2 The Characteristics of the Knowledge Economy

Knowledge constitutes the most important components of the knowledge economy. It is the predominant trait of the economies, which were librated from the old restriction and entered the age of the internet, electronic trade and the electronic banks. In other words, the knowledge economy is characterized by the capability for the generation and use of knowledge. It can also be termed as the capability for innovation. Accordingly, it is considered as the basis for the acquired relative advantage in the new economy, because knowledge is the principal means for the achievement of the efficiency of the process of production and distribution. Furthermore, knowledge is the improvement of the quality and quantity of production and the opportunities to choose between the various commodities and services whether it concerns with the consumers or the producers. Likewise, the governments have a key role in increasing the ability of innovation for both private and public companies (Tohidinia & Mosakhani, 2010, pp.611-631).

Thus, the knowledge is distinguished from the traditional economy by its basic dependence on investment, human resources and the labour force; which is qualified, specialized and trained on the new technologies, considering that the knowledge and intellectual capital is the one which distinguishes the knowledge economy. Hence, it is the transition of the economic activity from the production and manufacturing of commodities only to the production and manufacturing of the knowledge services.

Knowledge economy is also the activation of the processes of research and improvement, as a mover for change and development.

The Table 3 below shows the characteristics of the knowledge economy through the conduction of a comparison between the old and new economics about the organizational characteristics, labour characteristics employment and the characteristics of production.

Table 3: The Characteristics of the Knowledge Economy in Comparison with the Old Economy

		P. economy	**K. economy**
The organizational characteristics	Field of competition	- National	- International
	Markets	- Stable	- Fluctuated
	The business movement	- Low/ medium	- High
	The role of the public sector	-Preparatory: the infrastructure, the commercial polices, the beneficial industries	- Directing: privatization, admission to the world trade organization, regional blocs, partnership with the private's sector
Characteristic of labour and employment	The relationships of the labour market	- Competitive	- Solidarity/ collecting
	The required skills	- Skills specified according to the jobs	- Comprehensive learning
	The necessary organization	- Specified according to the tasks	- Continuous learning for lifetime learning by practices
	The objectives of the policies	- To generate employment opportunities	- High wages/ incomes
Characteristics of Production	The relationship with the other establishment	- Independent adventures risks	- Unity and cooperation
	Sources of the competitive value	Economic block	- Renovation, quality
	The main resources of productivity	The machine	- The digital
	The guidelines of growth	Factors input (labour, capital)	- innovation, renovation invention, knowledge

Source: *Mohammed Abdel'Aal Salih: The guidelines of the industrial development in the new economy: an entry submitted to: the first annual conference of the Omani Economic Society Muscat, 02 – 03/ 10/ 20005.*

7.3 The Indexes of the Knowledge Economy

The indexes of the knowledge economy mean: "the measurement of the extent of preparedness or readiness of a specific country or a body for the transition towards this kind of economy (Saeed Okiel, 2011, P. 245). It is to know the extent of the possibility of the accession of the state into this new economy; this is based to a greater degree on the knowledge revolution.

To explain the reality of the knowledge economy and its previous, present and subsequent trends of development, some of the most important indexes of knowledge economy will be considered with illustrations.

a. Index of Research and Development

The data of research and development, the statistic of the patents, the scientific publications and the total expenditure on the technology, are the elements that are considered as the essential pillars in the development of this index. Hence, it is the success of the knowledge-based economy.

b. The Index of Education and Training

The human resources index is considered as one of the basics of the knowledge economy. Therefore, it is considered among the important indexes, which explains the extent of the improvement and development of the human resources; through some of the important aspects such as education, training, investment in the human capital, and the human capital stock.

c. The Index of the Information and Communications Technology

The World Bank defines information and communication technology as a: "a group of activities which facilitate the preparation of information, their transmission and display through the electronic means". This index contains several dimensions and among them the connecting of technology and its usages, and the international usage of the communication traffic.

d. The Index of the Computers Infrastructure

This index includes all the processes which are related to the computers, especially if this matter is connected with the number of the computer sets in each one thousand of the population and the users of the spider net.

7.4 Evaluation of the Reality of the Knowledge Economy in the Gulf States

The attention of the governments of the states of the Gulf Cooperation Council is increasing, concerning the diversification of their economies for the sake of achievement of the hoped-for economic and social development. Therefore, these states strived to firmly establish the pillars of the knowledge economy and the knowledge industry, in preparation for the transformation from the rent economy and adoption of the path of economic diversification. It is worth mentioning here that, the states of the Gulf Cooperation Council possess the financial capacity and the international companies in the field of research and development besides the accumulation of experiences.

It is possible to get acquaintance with the reality of the knowledge economy in the states of Gulf Cooperation Council and the states of the Kingdom of Saudi Arabia, in

comparison to the countries of the Gulf Cooperation Council in the knowledge industry through the following:

8. The Economic and Human Development in the States of the Gulf Cooperation Council

Through the data stated in the comparison Table (3), which represents the level of economic and human development of the states of the Gulf Cooperation Council, it is noted that the highest per capita share of the Gross Domestic Product is in Qatar, which is (133713). While the Kingdom of Saudi Arabia occupies the fourth rank (50791), as to the last rank it is the Sultanate of Oman (20540). The Kingdom of Saudi Arabia occupied the last rank in the rate of unemployment as it amounted to (5.6). As to Qatar, it occupied the first rank where it represents the least percentage of unemployment among the states of the Gulf Cooperation Council (0.4). Nevertheless, while looking on the index of the human development, it can be found that the Kingdom of Saudi Arabia has occupied the first rank with the rate of (0.836), while Oman occupied the last rank in respect of this index (0.783).

Table 4: The level of Economic and Human Development in the Gulf States

State	Gross Domestic Product per capita (2012 – in the prices of 2011)	Human development index	Rate of unemployment
Bahrain	40658	0.815	1.1
Kuwait	84188	0.814	3.6
Oman	20540	0.783	-
Qatar	133713	0.803	0.4
Saudi	50791	0.836	5.6
Emirates	57045	0.827	4.2
Gulf States	54061	0.788	4.4

Source: *Global Development indexes, the World Bank and the Human Development Report, 2014.*

8.1 The Knowledge Industries of the states of the Gulf Cooperation Council:

The Table 5 below of the knowledge economy indexes in the states of the Gulf Cooperation Council shows the following:

- As to the knowledge economy index (KFI) of the states of the Gulf Cooperation Council, it can be seen that, the United Arab Emirates ranked the first at the Arab and Gulf level with a score of (6.97 points), followed by Bahrain (6.9). While the Sultanate of Oman ranked in the third position (6.14), then the Kingdom of Saudi Arabia (5.96), and Qatar (5.84) and lastly Kuwait (5.33).
- According to the knowledge index (K1), it is found that the United Arab Emirates came at the first position of Gulf level with a score of (7.09 points) followed by Bahrain (6.98). While the Kingdom of Saudi Arabia ranked in the third position (605), then the Sultanate of Oman (5.87), and Qatar (5.5), and lastly Kuwait (5.15).

- It is also noted that, the economic incentives and institutional regimes index differ in the ranking, as it is observed that the Sultanate of Oman is to the first position on the Gulf level with a scores of (6.96), followed by Qatar (6.86), then Bahrain (6.69). While the United Arab Emirates is in the fourth position (6.5), then Kuwait (5.86) and lastly Saudi (5.68).
- According to the innovation index, it is found that the United Arab Emirates is in the first position while the Kingdom of Saudi Arabia came in the last position. As to the education index, Bahrain came in the first position and the Kingdom of Saudi Arabia is in the third position, as for Qatar it came in the last position.
- About the information and communication technology it is found that Bahrain came in the first position followed by the United Arab Emirates, then the Kingdom of Saudi Arabia, while the Sultanate of Oman is in the last position among the states of the Gulf Cooperation Council.

Table 5: Table of the indexes of the knowledge economy and the knowledge industries, 2012

Country	Rank of the state out of 146	Knowledge economy index (K1) rate of results	Knowledge index (K1)	Economic incentives regime index	Innovation index	Education index	Information and communication technology index
Emirates	42	6.94	7.09	6.5	6.6	5.8	8.0
Bahrain	43	6.9	6.98	6.69	6.61	6.78	9.54
Saudi	50	5.96	6.05	5.68	4.14	5.65	8.37
Oman	47	6.14	5.87	6.96	5.88	5.23	6.49
Qatar	54	5.84	5.3	6.86	6.42	3.41	6.65
Kuwait	64	5.33	5.15	5.86	5.22	37	6.53

Source: *The World Bank knowledge assessment methodology report – (KAM – 2014).*

9. Analysis of the Knowledge Economy Indexes – Kingdom of Saudi Arabia

Through the analysis of the reality of the knowledge economy of the states of the Gulf Cooperation Council, it was observed, that the Kingdom of Saudi Arabia is facing several challenges for the achievement of its developmental objectives resulting from a gap on the level of all the knowledge economy indexes. Therefore, each index will be analyzed separately concerning the Kingdom of Saudi Arabia.

9.1 1. Research and Development Index

Studies are considered as the base for improvement and development, as the majority of the states headed towards the digital and technological environment, through the establishment of centres for researches and development so as to go global in all sectors. Here, the analysis of the position of the scientific research and monitoring the

extent of the scientific progress, advancement, and innovation in the Kingdom of Saudi Arabia is targeted. This aimed to know the aspects of strengths and weaknesses, which may help in the determination of the necessary requirements for the continuation of the development, which are based on knowledge, creation, and renovation. If research centres in the universities in the Kingdom are observed according to the report of the Ministry of Public Education 2013, it can be found that it increased to (107) research centres. Additionally, to (7) centres outside the universities and there are important points included in this index and the most salient ones are:

a. Distribution of the Published Scientific Essays

The following Table 6 shows the distribution of the published scientific essays in some states in the region according to the knowledge report, 2014.

Table 6: Distribution of the Published Scientific Essays in a Number of States in the Region (2005 – 2009)

State	Number of the published scientific assays
Turkey	81.9 thousand pages
Iran	42.6 thousand pages
Egypt	17.5 thousand pages
Saudi	7.9 thousand pages
Jordan	3.9 thousand pages
Kuwait	2.9 thousand pages
Lebanon	2.7 thousand pages
Oman	1.4 thousand pages

Source: The Arab knowledge report, 2014, (Youth and acclimatization of knowledge).

The preceding Table shows that Turkey produces almost half of the publications of the compared states which include (6) the Arab States in addition to Iran and Turkey. As to the share of Iran, it amounts to about one-quarter of the production of the group. Egypt produces one-eighth of the production of the group and half of the production of the other five Arab states combined; while Saudi produces about half the product of the group. It may be said that the Saudi has achieved progress during the last decade. Nevertheless, it is a model in comparison with other various states of the world, according to the findings of the UNESCO in its report on the field of scientific research in the world.

b. The Human Force which is Working in the Field of Scientific Research

The data of the UNESCO indicate that, the numbers of the part-time researchers who works in the scientific research in the Kingdom of Saudi Arabia are (42) for each one million of the population. This indicates, the numbers of the part-time scientists in the field of research and development are smaller in comparison with the number of part-time scientists and researcher in the same year in a state likes Argentina. Its number amounts to (1236) researchers to every one million of the population, and in Spain there are (2800), and Finland (7423). Through the previous figures, it is illustrated that the number of the researchers is very limited in the Saudi in comparison with other states in the world (World Banks 2014 – OECD, 2014, UNESCO, 2014 a).

c. Expenditure on Research and Development Activities

The available statistics indicate that the rate of expenditure on research and development as a ratio of the Gross Domestic Product in the Kingdom of Saudi Arabia is small and modest in comparison with rates of the international expenditure. According to the data of the Arab Institute of Planning, Arab competitiveness report, 2012, it is found that the expenditure on the scientific research represents (0.01%), which is incommensurate with the Saudi citizen's ambitions for development. Also with their capabilities, potentialities and their human and physical capacities, when compared with the states of the European Union, whose rates of expenditure on research and development amounts to (1.98%), or Japan with the ratio of its expenditure on the scientific research of about (3.39%). This clearly explains the extent of the gap between the Kingdom of Saudi Arabia and the advanced states. Although, the research and development index according to the sub-indexes of the innovation inputs in the data of the world innovation guide, indicates that the Kingdom of Saudi Arabia is in the fifth position on the Arab States level. It also comes in the second position on the level of the states of the Gulf Cooperation Council. Table (7) below confirms that the level of the Kingdom of Saudi Arabia, is still lower than the international level, in spite of the improvement of its level on the Arab and Gulf level.

Table 7: The Sub-Index of the Innovation Inputs: The Human Capital and Research

State	Research and development	State	Research and development
Emirates	19.0	Lebanon	22.7
Saudi	15.1	Tunis	18.3
Qatar	8.3	Morocco	9.1
Bahrain	6.0	Egypt	16.2
Jordan	13.5	Algeria	1.6
Kuwait	2.6	Sudan	3.3
Oman	5.5	Syria	0.0

Source: *Arab knowledge report, 2014 (Youth and acclimatization of knowledge).*

d. Patents (on Invention)

From the Table below, it is noticed that the total of the registered patents in (18) Arab states since (1963) and until (2013) is (821) patents. This represents less than the total of one state like Malaysia. Nevertheless, the Kingdom of Saudi Arabia, with the total of patents since (1963) has surpassed states such as Turkey and Greece. However, in (2013) it ranked first on the Arab and Gulf level. This is due to the positive policies which the Kingdom of Saudi Arabia is undergoing. Such as the building of the national innovation capabilities for the reform of the education, opening of new universities and research institutions, the support for the business pioneers, business incubators, and provisions of advanced infrastructures for the information and communication technology. Nevertheless,

it is less than the required level as Finland alone is (1221) and Korea (1450), as to Germany it is (15498). Therefore, it is incumbent for the growth to be on an international level.

Table 8: Registration of Patents at the American Office for Patent and the Trademarks of the Arab States and Some of the Compared States

State	Patents (2013)	Patents (1963 – 2013)	State	Patents (2013)	Patents (1963 – 2013)
Saudi	237	858	**Bahrain**	2	8
Kuwait	84	212	**Sudan**	0	7
Egypt	34	212	**Libya**	0	4
Emirate	18	120	**Yemen**	0	3
Lebanon	7	101	**Mauritania**	0	3
Morocco	1	78	**Total Arab State**	403	1821
Tunis	4	37	**Malaysia**	214	1892
Jordan	6	36	**Finland**	1221	19513
Syria	0	22	**Rep. of Korea**	14548	118443
Oman	3	18	**Germany**	15498	375692
Algeria	0	14	**Turkey**	74	817
Iraq	0	10	**Philippines**	27	509

Source: *Arab knowledge report, 2014, (Youth and Acclimatization of knowledge).*

9.2 2. Education and Training Index

The human source is considered as one of the principles of the knowledge economy. It is one of the indexes, which may be measured to know its relationship with the knowledge economy, through some aspects related to the human resources themselves such as education, training and investment in the human capital and its stock.

a. Education and Training

The Kingdom of Saudi Arabia has been very keen to introduce the most recent services and to develop the education and training systems. In this respect, it established schools and provided them with the most up-dated technologies and the means of communications and it improved the teaching systems and methods. It also undertook the eradication of the illiteracy of the individuals, as it opened illiteracy eradication schools and it provided opportunities for distance education. If the rate of expenditure on education as a percentage of the Gross Domestic product in the Kingdom of Saudi Arabia is considered, then Saudi Arabia ranks fifth position comparative to the Arab states with (5.14%). While the rate of expenditure on education as a percentage of the total public expenditure is (17.74). Here, a slight improvement is found, where the pillar of education and human resources had increased, being one of the knowledge indexes according to the knowledge report (2012) from (4.28) in (200) to (5.65) in (2012) with a change of (1.37+).

b. The Human Capital Stock and the Investment therein

The process of the human capital accumulation takes place through the increase of the level of the distinctive skills, knowledge and business of the individuals. For this process to be accomplished, investment must be made in the human capital. Undoubtedly, the process of investment in the human capital requires an allocation of special budget for developing the process of education, through the training of the employees on the educational and instructional process. What is meant here is To transform the working human force from a mere demographic quantity, which constitutes a burden on the process of developing the human capital, into an effective force in the production. Furthermore, it is an achievement of a knowledge wealth for the enhancement of development and to transfer to the knowledge economics.

9.3 The Index of Information Technology and the Infrastructure of the Computers

The infrastructure of the information and communication technology is a basic component in the knowledge economics. It is the fundamental determinant of the structure and level of the competitiveness of the macro-economies, which is based on knowledge innovation and regeneration. It is worth mentioning, that the successes of the technology in the realization of this objective is contingent on the preparedness of the infrastructure; and the extent of its accessibility for all and the efficiency of its employment in the society. It is discovered that, the Kingdom of Saudi Arabia has made good and successful progress for the construction of the internet network and the use of the computer and the mobile telephone. Nevertheless, still there is a gap between it and the advanced states. For instance, the percentage of the households who had a personal computer represents (57.3%). As to the use of the mobile telephone in the Kingdom of Saudi Arabia, it is recognized that the subscribers of the mobile telephone are (176.5) for each (100) individuals. This means, it does not suffer any shortage in the coverage of the mobile networks for many regions. However, if the use of the information and communication technology in the state and the government is considered, it can be determined that, the Kingdom of Saudi Arabia is in the (36) rank from the number of (193) states. While the percentage of the internet users for each (100) individuals is (60.5) bearing in mind that the index value is (0.69).

9.4 The Challenges in the Transition to the Knowledge Economy – Kingdom of Saudi Arabia

For the Kingdom of Saudi Arabia to be able to transform into the knowledge economy, and to turn towards the economic enhancement and the sustainable economic development; it should overcome the various challenges resulting from the reduction of the knowledge gap, which appeared through the analysis of the previous indexes of knowledge. The important challenges faced by the Kingdom of Saudi Arabia, lies in the manner of transition from a traditional economy depending on oil to an economy guided by the knowledge economy indexes. Among these challenges are the diversifications of the sources of income, up-dating of the bases of production and the restructuring of the various economic sectors. In addition to a good preparation of the national human resources, besides laying down of sound controls for the attraction of immigrant labour in conformity with the requirements of the current stage and to encourage research, creation and invention. Therefore, the major problem being faced by the Kingdom of Saudi Arabia

in the transition to the knowledge economy lies in a number of basic axes and the important ones are:

- The decrease of the percentage of expenditure on research and advancement in the Kingdom of Saudi Arabia in comparison with the advanced states.
- The weakness of the relationship between the issues of development and the advanced technological infrastructures on the level of the state.
- The weakness of creation and innovation in the work in most of the Saudi higher education directorates and research centres.
- The decrease in the knowledge level of the human resources and the effectiveness of production and services (Hussien Al-Talafiha & Mohammed Batwieh, 2012, P. 14).

10. Conclusion and Discussion

To face the aforementioned challenges, the Kingdom of Saudi Arabia should stimulate the knowledge economy through reconsideration of the strategies of education and their branches, opening more schools, vocational college, and universities, adoption of universal education and eradication of illiteracy. Also, it is necessary to enhance the quality of education and the informatics. Furthermore, with the linking of the outputs of the institutions of education and training, with the requirements of development and the labour market, and to provide the appropriate environments for the attraction of the high qualified scientific qualifications and to strive for the establishment of knowledge and technological cities and zones. Lastly, to adopt effective mechanisms for the consolidation of the relationship between the scientific and research institutions and the productive and service sectors, positive implementations have been recommended.

The knowledge economy in Saudi Arabia characterizes a great number of qualities that recommends an elementary difference from the economic system. The foundation of the knowledge economy has no temporal or geographic restrictions. Since, the inputs and products are often intangible, including information and skills they can be created and used in any locations at any time (Alodadi et al, 2015, pp.109-129). The economy of Saudi Arabia is powerful and positively commenced to achieve the desired goals. The changes in the price of crude oil make the growth uneven, still it has been efficiently robust, with constant positive growth rates over the past several years (Al-Filali et al, 2012, pp.47-76).

The intellectual and knowledge (cognitive) capital is considered as the most important and distinctive characteristic of the economy. Therefore, the scientific and research institutions ought to be linked with a national information Network and another intra-state one of high efficiency for the exchange of experiences, enrichment of the scientific research and the technological enhancement and the achievement of the principle of total quality. Moreover, the educational system should maximize the capability of the development, besides taking into consideration the necessity for the regular review and evaluation of the curricula and the program of science and technology in all kinds and stages of education and training; to pay attention to the scientific societies and to support and activate their role in the society. In addition to their strengthening, and to encourage

the establishment of scientific societies in the various fields, adoption of systems and programs which encourage and facilitate the generation, use and dissemination of the information of relevance to science and technology. Likewise, it is imperative to encourage the cooperation between the scientific and research corporations and their counterparts in the advanced states and to link the outputs of the education and training corporations with the requirements of development and the like.

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