

Article

Creating the Knowledge-based Economy in Kingdom of Saudi Arabia to Solve the Current Unemployment Crisis

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Abstract

The strategy of national economic management for the Kingdom of Saudi Arabia has been focusing on knowledge-based economy (KBE) in the recent years. After the oil crisis in 1973, the country realized that they must focus on technological development by creating skilled knowledge workers. With this vision, the government of the Kingdom heavily invested in the education sector, especially on education in petroleum related studies. The most recent example of such gigantic effort is the creation of King Abdullah University of Science and Technology. Unlike many other successful knowledge-based economies (KBEs), Kingdom's case is special as a great mass of foreign workers work in the low skilled areas. As a result, those sectors involving mostly cheap low skilled foreign workers could not raise their knowledge bar that much. The recent tension about the unemployment rate among the Saudi nationals is a result of such lacking. The Kingdom must realize a full fledged KBE in order to place their knowledge workers who are coming out of the universities with high skills and for that all the sectors must be knowledge oriented. This paper discusses on how the Kingdom can bring structural change by transforming its economy into a KBE and thereby bring sustainable solution to the current unemployment crisis.

Keywords: Kingdom of Saudi Arabia, Knowledge-based Economy, Knowledge Workers, Economic Development

1. Introduction

In the recent years, more and more academics and policy-makers are recognizing the fact that the economic growth of the twenty-first century is strongly knowledge-based and the industrialized economies are leading this shift into a knowledge-based economy (KBE). Many recent economic growth theories coined by many scholars consider knowledge, both as input and output, as a key source of long-term growth and job creation (Young, 1995; Mankiw, 1995; OECD, 1994; Fortin & Helpman, 1995). Like many countries around the

world, Kingdom of Saudi Arabia (KSA) also realized the need to shift their economy into a KBE and with that vision the issue of KBE in KSA has been coined in the recent policy-makings. The increased importance of knowledge is evidenced by growing investment in education and the rapid emergence of new information and communication technology (ICT) in the Kingdom. However, the intangible investment is not growing as much as the physical investment. As the Kingdom is heavily engaged in international trade, the country realizes the fact that firms and sectors with more knowledge (technology) perform better; countries endowed with more knowledge are more productive and more competitive; and individuals with more knowledge (skills) get better-paid jobs (Guellec, 1995).

Recent evidence shows that the Kingdom's economy is slowly becoming more and more dynamic but is not yet highly innovative. Kingdom's manufacturing sector has been shifting slowly out of low-technology, low-skill, low-wage, and labor intensive industries into medium-technology and medium-skill, medium-wage industries. If these stages can successfully be completed, the Kingdom will very soon step into high-technology and high-skill era. While the speed of change in the Kingdom's economy is not accelerating fast enough, the factors that contribute to this economic change are slowly shifting in importance. KSA's domestic demand remains as the most important source of change. Kingdom's single most important source of economic growth has been petroleum export. However, over the years, other private sectors and service sector have been growing slowly but not fast enough to absorb the growing domestic labor market which has been an output of Kingdom's strong emphasis on education. This paper argues that Kingdom's too much dependence on unskilled foreign labor (almost 80% of the total labor force) could not expand the employment opportunities for the newly graduates who have various skills. Therefore, a major concern in this study is the relationship between structural change and employment. This study focuses on what kind of structural change the Kingdom must adopt in its way to shift towards a KBE in order to bring a sustainable solution to the present unemployment crisis.

Keeping the above arguments into consideration, this paper addresses three main issues:

- Is Kingdom's economy shifting towards a KBE?
- What factors are driving this shift?
- How will the labor market adjust to the new KBE in the Kingdom to bring down the current unemployment rate?

It is quite natural that employment growth rate in an economy is directly determined by the growth rate of output and labor productivity in that economy. These growths in output and labor productivity are determined by industry dynamics and, in particular, by competitive intensity, innovation, and trade performance. The employment growth is affected by various factors such as the expansion of domestic demand and of exports and the impact of import penetration as well as labor productivity growth and changes in production techniques or processes. Kingdom's performance in international trade, expansion of domestic demand and of exports or in import penetration has been extraordinary. However, in terms of labor productivity growth and changes in production

techniques or processes, Kingdom's performance was not that decent. The main reason behind it is the fact that majority of the labor force in the Kingdom are from foreign countries and they are mostly unskilled or low-skilled.

This paper investigates the recent changes in the structure of employment in KSA by exploring the role of KBE in the changing structure of employment. The second section briefly presents an understanding of KBE while the third section sheds light on the KBE framework based on which our argument of KBE in KSA is developed. In the fourth section, a brief discussion about the KSA economy is presented followed by the fifth section that discusses on KSA's shift towards KBE. The sixth section sheds light on the long term solution for the current unemployment crisis in the Kingdom in the light of a KBE while the seventh section draws the conclusion.

2. Understanding the KBE

The term "KBE" was first introduced by the Organization of Economic Cooperation and Development (OECD). OECD (1996:7) describes KBE as an economy that is directly based on the production, distribution and use of knowledge and information. Later, Asia Pacific Economic Cooperation (APEC) extended this idea and came up with a definition of KBE as "an economy in which the production, distribution, and use of knowledge is the main driver of growth, wealth creation and employment across all industries" (APEC, 2000:2). Many scholars attempted to define KBE by looking at different aspects of investments of knowledge. In doing so, Khan (2001:4) looks at the different possible components of 'investment in knowledge' (IK), and attempts to define the KBE. He tries to make a list of common components of IK considering the common factors such as innovation and research and development (R&D), software, marketing, human capital, and organizational capital. KBE stems from the fuller recognition of the place of knowledge and technology in modern OECD economies (Chartrand, 2006:8). Chartrand (2006:8) further argues that the importance of knowledge and technology diffusion requires better understanding of knowledge networks and 'national innovation systems'. A knowledge economy is either focused on the economy of production and management of knowledge, or a KBE (Drucker, 1969). In an introduction to a special issue on the topic of what is KBE, David and Foray (2002) warned against using the metaphor of KBE. They cautioned that the terminology was coined recently, and noted that "as such, it marks a break in the continuity with earlier periods, more a 'sea-change' than a sharp discontinuity" (David and Foray, 2002: 9). 'Knowledge' and 'information' should be more carefully distinguished by analyzing the development of a KBE in terms of codification processes (Cowan, David, and Foray, 2000: 211-253). Indeed, some observers, such as David Wolfe (2002), argue that the so-called 'new economy' should more properly be called 'a learning economy' because of the transitory nature of knowledge. In an increasingly globalizing world, the physical barriers such as distance or geographical disadvantages are becoming narrower; the knowledge becomes more and more important to competitiveness both locally and globally. As the knowledge flows both vertically and horizontally, it creates better fit between research and

development (R&D) and downstream innovation and thereby increases the rate of innovation.

3. The KBE Framework

Knowledge Economy approach is capable of incorporating technical and institutional change into the mainstream of economic analysis and policy-making, rather than treating it as part of the rag-bag of 'residual' or 'exogenous' factors (Freeman, 1988:1). In this paper, the following framework of KBE is used to identify the macro picture of a KBE (See Figure 1). This KBE framework is developed based on World Bank's four pillars Knowledge Economy Framework. World Bank's KBE framework includes the following pillars (World Bank Knowledge Assessment Methodology, 2008):

- An economic and institutional regime to provide incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship;
- An educated and skilled population to create, share, and use knowledge well;
- An efficient innovation system of firms, research centers, universities, consultants and other organizations to tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new technology;
- ICT to facilitate the effective creation, dissemination, and processing of information.

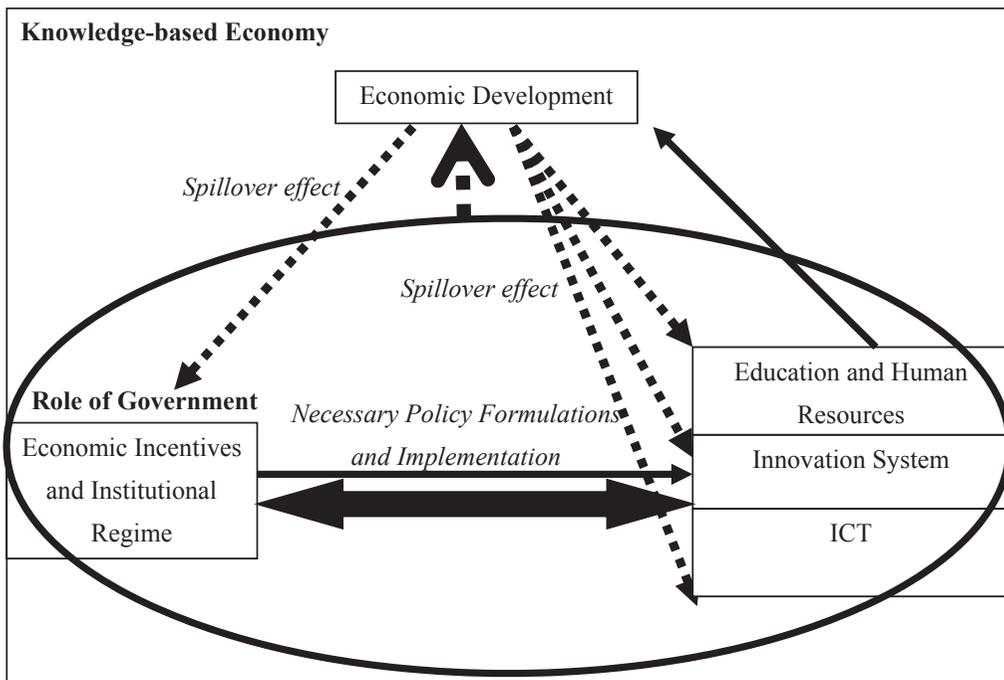


Figure 1 : Knowledge-based Economy Framework

Source: Developed by author.

The purpose of this framework is to establish the collective nature of the foundations of a KBE such as education, ICT and innovation system that are facilitated by the role of government through different policy and institutional settings. Figure 1 shows the relationship among the four pillars such as the role of governments, education for creating the skilled human resources, ICT infrastructure and the innovation system for innovation and invention. The rectangular boxes inside the circle represent the four pillars of KBE in Figure 1. The solid black arrows show the first-order development of KBE infrastructure. They show that the role of governments leads to better education and human resource development, better ICT development and better innovation system development and thereby better overall economic growth in the initial stage. At this stage or in later stages, the overall economic growth has spillover effects on all the four pillars as shown by the dotted black arrows in Figure 1. Once the first-order development works steadily, the second-order developments take place where all the four pillars interact with each other mutually or independently as shown by the solid black color double-faced arrow in Figure 1, leading to the creation of a complete KBE which ultimately contributes to the economic growth as indicated by the upward dotted arrow in Figure 1.

Economic Incentives and Institutional Regimes

As knowledge itself has significant indivisibilities and scale effects, this often leads to under-investment by societies without public intervention. It is no coincidence that societies that have high private expenditure on R&D also have significant public programs to support private R&D, increasingly at the small and medium enterprise level. Hence, it is important that the government plays a key role in setting the incentives right to create necessary policies and institutions to enable other pillars of the KBE. Just as investments in education are characterized by the need for similar synergies, the public role in establishing access to ICT infrastructure is crucial. Similar to the case of the global environmental commons, the collective nature of the KBE demands meticulous attention to incentives in order to ensure an optimal mix of public and private involvement. Governments' policy formulation is aimed to bring the balance between internal resources and capabilities (strengths and weaknesses) and external environmental relations (opportunities and threats). Policy formulation for a KBE is a part of the national policy formulation of a country which tries to make the difference within a competitive environment through exploiting knowledge (Rollo, 2002). In formulating the policies for a KBE on how to acquire, share, create and apply the knowledge to excel within a competitive environment, a country thus has to take all its environmental contexts into consideration and complement it with internal strengths to find out the one with the maximum return on investment. Therefore, the better the fit of KBE's policy formulation with its context, the better the country is expected to perform in its environment. The duty of governments is to ensure that social, human and economic issues are taken into consideration in their research activities and to inform their citizens about all social aspects relating to the scientific and technological progress made in the areas covered.

Education and Human Resource Development

One of the foremost important areas for governments is the education sector so that they can create the necessary human resources that are needed in any economy. During the industrialization and post-industrialization periods countries around the world are spending very considerable amount of resources for the development of educational sector to meet the demand of the new competition in a global economy. For the knowledge-based economies (KBEs), this trend in education sector is more realistic as they are trying to achieve economic growth through knowledge creation and diffusion. The main objective for the education system in a KBE is to bring out the best in every school child, developing sound morals and skills necessary to meet the demands of the rapidly changing world. Education in the KBEs plays a very important role in promoting social and economic changes by expanding the pool of professionals and executives as the government's education policy is designed clearly to create the human resources that the KBEs require for sustainable development. As a result, the education policy of the government in all KBEs emphasizes science and technological aspects of education. However, other fields of studies are also emphasized but left to the demand for the economic growth. In the KBEs, the governments' main goal in formulating education policies is to expand science and technology education to meet the demand for science and technology human resources in the competitive global economy. Time to time, the governments re-examine their educational policies and re-enforce the old policies with new initiatives and in some cases, they also create new policies. To foster greater creativity and innovation among students, many countries launched special program in the education development which focuses on developing students into active learners with critical thinking skills, and on developing a creative and critical thinking culture within schools. In the recent policy formulations for education, many governments are moving towards making information technology, biotechnology and some other core science subjects obligatory for undergraduate study.

ICT Development

In the last few decades of 20th century, ICT has transformed the world. It is becoming increasingly an effective tool for fostering growth both in developed and developing countries. By connecting people and places, ICT has played a vital role in national, regional, and global development, and holds enormous promise for the future. Governments of many countries especially in the KBEs realized that to create a KBE to compete at the global frontier, an innovation-based KBE requires a well-developed technological infrastructure, a set of capabilities-focused technology policies, as well as an institutional environment that stimulates innovation and entrepreneurship. The current KBEs being high in technological frontier need further technology creation to propel the economy forward (Koh and Wang, 2003:3). Since last couple of decades, when the ICT started booming, many governments took initiatives to make their economies technologically advanced by making great strides in broadening and deepening their technological capabilities to meet the demand of the 21st century.

Innovation System Development

Compared with the 1990s, the world's gini-coefficient in 2005 was 0.67, an increase of 10 percent. This increase has largely been credited to the use and creation of knowledge through innovation. The generation, diffusion, absorption and application of new technology, knowledge or ideas are crucial drivers of economic development for any KBE. Knowledge flows from certain advanced countries such as the United States, Japan and Germany remain the primary source of new ideas for other KBEs. There are three main channels for knowledge flows from the innovation frontiers to other countries – international trade, acquisition of disembodied knowledge and foreign direct investment (FDI). The role of government policies on innovation system development takes on added importance as countries move to an innovation based growth in global era of KBE. In terms of the development of scientific capability, there was a sustained shift from learning to use with high reliance on multinational corporations (MNCs) to learning to adapt and improve via “learning by doing” within MNCs as well as “learning by transacting” in local firms’ acquiring external technology. The next shift was learning to innovate, mainly, through applied R&D in product or process, and finally, learning to pioneer by creating indigenous technology and commercializing it in the marketplace through new ventures (Koh and Wang, 2003:17).

4. KSA Economy and Unemployment

The economy of Saudi Arabia has close correlation with oil production and its price as 90% of its export commodities are from petroleum and petroleum products (See Table 1). This can be seen well in the annual growth figures in GDP, consumption, and investment. As can be seen in Table 2, the structure of GDP, in terms of production did not change much during last 15 years (1994-2009). The private sector is steadily growing and the oil and public sector have the highest share. The country has strong international trade both in terms of export and import with US, China, Japan, South Korea and India. While these countries mostly import petroleum and petroleum products from KSA, KSA imports machinery and equipment, foodstuffs, chemicals, motor vehicles and textiles from these countries. In the Kingdom, an increasing number of youth graduates from high schools, colleges and universities are seeking opportunities in the job market. KSA's job market is not expanding fast enough to absorb this growing number of young people who have various skills. As a result, unemployment rate in the last ten years has been accumulating (See Figure 2). Although the country experienced continuous GDP growth since its entrance to the petroleum and petroleum products export since 1970s, the growth of other industrial sectors rather has been very slow which is causing the current unemployment crisis in the kingdom.

Table 1 : Industrial Facts About KSA

Major Industries	Crude oil production, petroleum refining, basic petrochemicals, ammonia, industrial gases, sodium hydroxide (caustic soda), cement, fertilizer, plastics, metals, commercial ship repair, commercial aircraft repair, construction.
Export Commodities	Petroleum and petroleum products 90%.
Export Partners	US 14.2%, China 13.6%, Japan 13.6%, South Korea 9.9%, India 8.2%, Singapore 4.3% (2012).
Import Commodities	Machinery and equipment, foodstuffs, chemicals, motor vehicles, textiles.
Import Partners	China 13.5%, US 13.2%, South Korea 6.6%, Germany 6.5%, India 6.3%, Japan 6% (2012).

Source: CIA Factbook, 2012.

Table 2 : GDP – Composition Labor Force in KSA

	GDP – Composition, by sector of origin as of 2012	Labor Force by Occupation (2005 est.)	Foreign Labor Force in KSA (2012 est.)
Agriculture	2%	6.7%	80%
Industry	65%	21.4%	
Service	33%	71.9%	

Source: CIA Factbook, 2012.

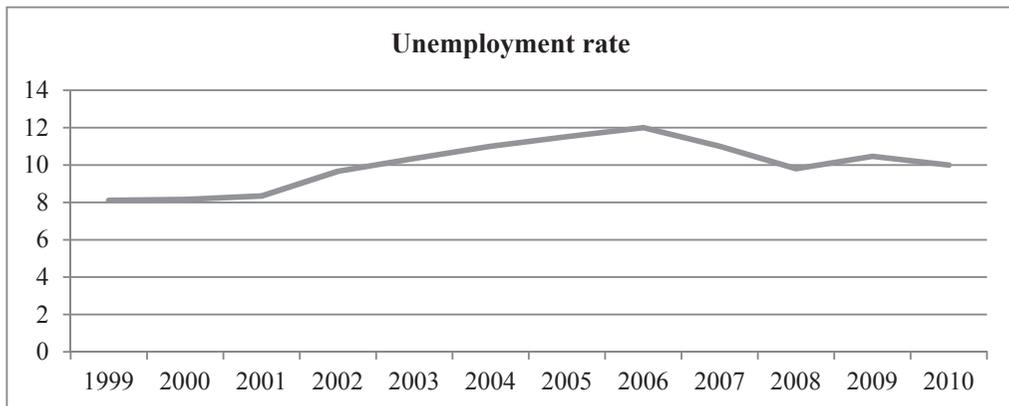


Figure 2 : Unemployment Rate in KSA, 1999-2010

Source: International Monetary Fund - 2011 World Economic Outlook.

5. KSA's Shift Towards KBE

KSA has been slowly moving towards a KBE. Since the ascend of King Abdullah bin Abdulaziz Al Saud to the throne in 2005, the country has stably managed state affairs by adhering to a KBE by starting to formulate necessary policies. These policies include the introduction of innovative social systems and many other innovative programs in economic policy such as post-petroleum job creation through the promotion of private sector,

establishment of necessary industrial clusters for economic diversification and active inducement of foreign investment. However, the development of each pillar of KBE as described in the KBE framework is not equally distributed, in fact, in the some pillars; the Kingdom experienced a negative growth. Measuring the KBE is very challenging as it significantly involves a lot of input and output factors that are qualitative in nature and it is very hard to quantify them. For simplification, the knowledge index (KI), and knowledge economy index (KEI) to understand the current status of KBE in KSA have been used here. KI measures a country's ability to generate, adopt and diffuse knowledge. Methodologically, the KI is the simple average of the normalized performance scores of a country or region on the key variables in three pillars such as education and human resources, ICT and innovation. KEI takes into account whether the environment is conducive or not for knowledge to be used effectively for economic development. The KEI is calculated based on the average of the normalized performance scores of a country or region on all four pillars related to the knowledge economy such as economic incentives and institutional regime, education and human resources, ICT and innovation infrastructures.

Table 3 shows the scores of KSA in all the four pillars including the KI and KEI indices. From the table, it is clear that KSA's overall performance towards shifting its economy into a KBE is positive. The country experienced positive growth in three pillars of KBE while in terms of innovation pillar; the country has experienced a clear setback since 1995 and as such, the kingdom must focus on innovation pillar in order to rip full benefits of its efforts towards transforming KSA into a KBE.

Table 3 : KSA's Shift Towards KBE

KBE Indicators	1995	2000	Most Recent
KEI	6.26	6.87	6.60
KI	6.36	7.06	6.82
Economic Incentives and Institutional Regime	4.72	4.63	5.93
Education	5.00	5.37	7.53
ICT	7.41	5.74	8.33
Innovation	6.67	5.56	4.61

Source: Knowledge Assessment Methodology, World Bank.

Economic incentives and institutional regime

The appropriate economic incentives are very crucial to the growth of a KBE. Without appropriate economic incentives, it is difficult to foster growth in a KBE. Openness towards trade, stable financial and monetary systems that allow minimal price distortions and creating sound investment opportunities, competitive business and investment environments and presence of appropriate property rights legal system are some of the main factors in the economic incentives that encourage entrepreneurs and competition which ultimately lead to continuous innovation in the knowledge-based economic growth. Saudi Arabia's economic incentives score is 62.2, making it the 77th country in the 2014

Index (Heritage foundation, 2014). Its score is 1.6 points better than last year, reflecting improvements in the control of government spending, labor freedom, and monetary freedom that outweigh combined score declines in trade freedom and business freedom. Saudi Arabia is ranked 8th out of 15 countries in the Middle East/North Africa region, and its overall score remains above the world average. This shows the Kingdom's improvement in terms of creating more economic incentives in the country for economic growth.

An effective, accountable and corrupt-free government and an appropriate legal system that ensures rule of law and efficient regulatory quality are necessary to support and enforce the basic rules of business to allow fair and competitive business environment for continuous innovation (Chen and Dahlman, 2005: 8-9). Many scholars argued that good governance is absolutely necessary for having a functional institutional regime that would include an effective, impartial and transparent legal system that protects property and individual rights; public institutions that are stable, credible and honest; and government policies that favor free and open markets. In KSA, these conditions should encourage both government and private domestic investments and foreign direct investment (FDI), by protecting privately held assets from arbitrary direct or indirect appropriation. Generally, "good governance" indicators have six dimensions: i) Voice & Accountability, ii) Political Stability, iii) Government Effectiveness, iv) Regulatory Quality, v) Rule of Law, and vi) Control of Corruption (Kaufmann *et al.*, 1999).

Using the data from 2003-2012 for the above six indicators, a time series trend of good governance of KSA is shown in Figure 3. From the figure, it is evident that KSA's performance in terms of all good governance indicators is not same. However, in terms of government effectiveness, regulatory quality and rule of law, the country was performing great. For realizing a KBE, a country must also maintain a great degree of political stability. Since 2011, KSA faced with some problems in this regard. However, the

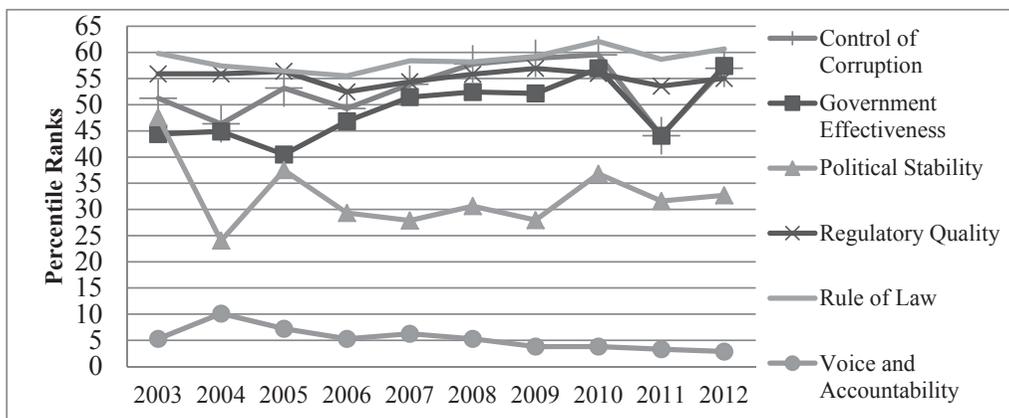


Figure 3 : Good Governance in Saudi Arabia

Source: World Bank Database.

government's swift actions put the country into right track again soon. So, KSA's overall performance in terms of economic incentives and institutional regime is slowly and steadily moving towards creating a KBE in the country. However, the growth must be more faster in order to gain competitive edge with other countries in the Middle East and in the world. With this view, the government is introducing new policies as can be seen in Kingdom's 'Vision 2020' strategic planning.

Education and human resources

Expenditures show that hard infrastructure was the primary area of concentration in the first three annual plans. However, the 4th plan which began in 1985 shows that human resources took more than 33.0% and now it accounts for more than half of the total expenditure (See Table 4). It indicates that the Saudi government is putting much effort on education including technological education which is directly linked to the creation of a capable knowledge workforce that can serve the need in a KBE. As can be seen from the 5 year economic development plans, human resources development is of critical importance in Saudi Arabia and consequently, as of 2009, there were about 4.9 million students and 750 thousands students in the process of higher education. Considering the total population to be 20.6 million, the number of students is quite significant (See Table 5).

Table 4 : KSA's Development Expenditures, 1970-2009 (Unit: USD Millions)

Development Plans	Infrastructure	Economic Resources	Human Resources	Social & Health Services
First Plan 1970-1974	41.3	27.9	20.5	10.3
Second Plan 1975-1979	49.3	28.0	14.7	8.0
Third Plan 1980-1984	41.1	30.7	18.4	9.8
Fourth Plan 1985-1989	28.9	20.4	33.0	17.7
Fifth Plan 1990-1994	21.8	10.0	48.3	19.9
Sixth Plan 1995-1999	16.2	11.5	51.5	20.8
Seventh Plan 2000-2004	12.6	11.2	57.1	19.1
Eighth Plan 2005-2009	14.2	12.2	55.6	18.0

Source: Ministry of Economy and Planning, Kingdom of Saudi Arabia.

Table 5 : Education and Human Resource Development in KSA,2001-2009 (Unit: thousand)

	2001	2002	2003	2004	2005	2006	2007	2008	2009
General Education (Male and Female)									
Total Enrollment	4530	4605	4477	4551	4643	4747	4813	4949	4987
Primary	2309	2316	2342	2385	2415	2443	2443	2470	2466
Intermediate	1084	1113	1094	1078	1070	1100	1145	1189	1194
Secondary	749	842	886	892	953	1001	1013	1059	1102
Others	344	333	156	196	204	212	212	231	225
Higher Education	432	445	525	572	604	636	682	715	758

Source: Institute of Public Administration, Kingdom of Saudi Arabia.

ICT

Similar to the developments in education and human resources, the Kingdom experienced remarkable growth in ICT over the years as government took special initiative to improve this sector. With the approval of Telecom Act in 2001 and introduction of the Telecommunication Bylaw, the country's ICT sector witnessed a great number of significant developments. The ICT index in Table 3 reconfirms this fact that KSA's ICT achievement has been very significant. Early market reforms and liberalization activities resulted in the licensing of the incumbent Saudi Telecom Company, its corporatization process as well as the liberalization of some services. By 2004, the liberalization of mobile and data markets through the licensing of new entrants resulted in the introduction of competition in the sector. In 2007, the fixed-line market was liberalized, and various regulatory frameworks were developed through open public consultation processes designed to meet the rapidly evolving market needs. In 2008, alongside the updated National Frequency Plan a number of Fixed Services were issued as part of the liberalization process. All these activities are parts of government's larger plan to create a conducive ICT infrastructure that will be further pushing the Kingdom towards a KBE.

Innovation

KSA has achieved the status of middle or higher income countries in the last couple of decades of the 20th century. Compared with the developments in education and ICT, the country could not show remarkable growth in terms of innovation that could lead the country towards a KBE with a faster speed. Table 6 shows a comparative look about the development of the four pillars of KBE among the Middle Eastern countries. From, the table, it is evident that KSA falls behind most of the Middle Eastern countries in terms of innovation although the country performed well the other three sectors. In fact, from Table 3, it can be re-confirmed that indeed the innovation sector is experiencing a downward trend in KSA. The current unemployment crisis in the Kingdom is directly related to the fact that KSA is yet to make ground breaking developments in terms of innovation both by government sector and private sector. The government's efforts towards creating a capable workforce and strong ICT infrastructure must be complemented with necessary innovation system so that the economic system that is knowledge based can absorb the growing number of skilled graduates in different areas. In this case, the private sector must play a very vital role. Realizing this, the government of KSA is trying to formulate necessary policies and creating governmental bodies that will look after KSA's transition towards a KBE. Industrial development has been in the forefront in this regard. Major institutes related with industrial development of Saudi Arabia include the Ministry of Commerce and Industry that handles overall affairs of the industry in Saudi Arabia, the Chamber of Commerce in each district that functions as a coordinator between the public sector and private sector in the industrial circle and issuing the license/permit of business in the local community, the Saudi Arabia Science and Technology Agency that drafts the policies related with the scientific technology of Saudi Arabia, King Abdulaziz City for Science and Technology (KACST), and Saudi Arabia Industrial Development Fund that provides loans to the related industries. In addition, there exists the national industrial cluster

development program aimed at promoting industrial diversification.

Table 6 : KBE in Middle East

Country	KEI	KI	Economic Incentive Regime	Education	ICT	Innovation
UAE	6.94	7.09	6.5	5.8	8.88	6.6
Bahrain	6.9	6.98	6.69	6.78	9.54	4.61
Oman	6.14	5.87	6.96	5.23	6.49	5.88
Saudi Arabia	5.96	6.05	5.68	5.65	8.37	4.14
Qatar	5.84	5.5	6.87	3.41	6.65	6.42
Kuwait	5.33	5.15	5.86	3.7	6.53	5.22
Jordan	4.95	4.71	5.65	5.55	4.54	4.05

Source: Knowledge Assessment Methodology, World Bank.

The Industrial Cluster Development Program forms the gist of 'Vision 2020' which is the industrial policy of Saudi Arabia, and has been promoting five industries (minerals & metals, automotive industry, plastic & packaging, home appliances, and solar energy products) from 2009 to 2014. It aims at increasing the ratio of manufacturing business from 10% to 20% of GDP, the employment rate from 15% to 30%, the export ratio of the industrial field from 18% to 35%, the ratio of technology-based manufacturing business from 30% to 60%, and the high-added value economy by 8% annually.

6. Solving the Unemployment Problem in KSA's Growing KBE

KSA must realize a full-fledge KBE in order to bring sustainable solution to its current unemployment crisis. From the discussion in the earlier section, it is clear that KSA made substantial developments in terms of education and ICT. In terms of economic incentives and institutional regimes, the country's progress is also positive although there is room for more development in this pillar of KBE. The only pillar, the country has been falling behind compared to other Middle Eastern countries is innovation. KSA has to build up a strong innovation infrastructure in order to realize a KBE. Availability of enough scientists and engineers is a very important pre-requisite for creating a functional innovation system. The government of KSA must continue to increase the science graduates. As the journey began towards becoming a KBE, the expenditure on R&D in KSA has been increasing. The role of R&D expenditure in KSA is quite large. Parallel to the government's continuous efforts to increase the investment in R&D, the business sector also must play a very important role in the overall advancement of R&D in the private sector. The investment in R&D is expected to increase the total R&D personnel working in business enterprises while improving the R&D quality. A reflection of this development can be seen in the number of scientific articles published by the authors of KSA. These efforts should bring substantial developments in capacity building in KSA helping the country to move from licensing or imitating foreign companies to conducting formal research and

pioneering its own new products and processes. These efforts of capacity building must be backed up by the institutional improvements, reducing microeconomic instability and improving overall human capital status in KSA. Again, in the area of R&D, collaboration between the business community and local universities should bring meaningful results. Government procurement decisions should be facilitating the technological innovation in KSA that will, in future, push the country towards the frontier of innovation. As for the output picture, patent and patent citations provide very strong indication of innovation output of an economy. Although historically, KSA is far behind many developed KBEs in terms of innovation, nevertheless, patentable innovations will be of growing importance in the country provided the above steps have been realized. In this regard, the country must prioritize which sectors to be focused. Until these days, petroleum and petroleum products have been the main area of concentration in KSA although in the recent years the solar energy is getting upper hand. Likewise, the country must develop a concrete plan as to promote specific sectors for innovation that will create jobs and thereby enhance economic growth in KSA. In order to do that, there will be greater need for intellectual property rights protection and other legislative supports for innovation. The following three steps are recommended in this regard that will gear up KSA's competency in innovation:

Step1: Initial Absorption of Foreign Technology and Knowledge

The innovation of new technology and knowledge is still centered in certain geographical locations and they lead the global frontier of innovation. The spillover effects and technology transfer enhance further improvement of the initial innovations in the advanced countries. The advanced countries of the world also do not perform equally in the global frontier of innovation. For example, at least 80% of the domestic productivity growth in most OECD countries is from the foreign sources of technology (Eaton and Kortum, 1996). Only a few advanced countries such as the USA and Japan are exceptions and lead the global frontier of innovation. Almost 80% of the world's R&D is still carried out in the developed nations (Brahmbhatt and Hu, 2007:6). However, due to globalization, the speed of technology and knowledge transfer to other countries has been ever faster. This creates opportunity to increase or improve on the newly invented technology and knowledge by the participation of other countries. KSA needs to get the necessary technology and knowledge transfer from the advanced countries and most of the time it has to innovate on the existing technologies and knowledge. Available data indicate that KSA, in this regard, can employ three main channels to acquire advanced foreign technologies and knowledge such as international trade, FDI and disembodied knowledge flows.

Step 2: FDI- A major contributor to innovation

FDI has been slowing increasing in KSA reaching USD 221.2 billion in 2012 (CIA Factbook, 2012). The growing learning capacity correlated to the competitive education and training of the labor force, extent and quality of domestic R&D and the domestic innovation efforts of the domestic companies in KSA started attracting more FDI in the recent years. Brahmbhatt and Hu (2007) mentioned in this regard that domestic R&D not only generates new knowledge but also enhances the firms' ability to assimilate and exploit

existing knowledge and as a result, they are more likely to be benefitted from FDI spillovers. This, in turn, helps them to be selected as suppliers to sophisticated global production networks provided they possess significant in-house design, engineering and other capabilities. So, it is quite apparent that domestic innovation and FDI are mutually supportive. In the recent decades, FDI has become one of the most important means of receiving advanced technologies and knowledge from the developed countries to many countries. The multinational corporations (MNCs) play very important role in this regard by using FDI as a way to use their advanced technology to take the advantage of producing low cost, yet high quality products. In many cases, the MNCs are the pioneer in introducing new product and process innovations, managerial expertise, maintaining quality standards, and accessing capacity to the global export markets for the countries they bring FDI in. As the MNCs will bring in new technologies and managerial know-how, KSA will have two benefits such as intra-firm technology transfer in which the technology transfer is between the parent company and its affiliates and technology spillovers to other domestic firms. The affiliates of the MNCs achieve higher productivity by accessing the parent company's superior technological know-how with relatively lower costs. As they produce high quality products, a standard set by the parent companies, the affiliates take the advantages to compete in the market more efficiently and, this, in turn, raises the customer choice in the market. As one would expect, this also enhances productivity in the rest of economy in the host country by increasing competition as the technological spillovers take place along with the expertise movements. KSA imports machinery and equipment, foodstuffs, chemicals, motor vehicles and textiles in huge volume. The country can give the companies of the above mentioned products great incentives to move into KSA for their production and R&D which will definitely create jobs in KSA as well as have positive impact in the economic growth.

Step 3: From Imitation to Innovation

In the beginning, KSA has to learn from reverse engineering with relatively simple products that do not require advanced and specialized R&D capability. However, this work of reverse engineering will help KSA to realize the potential of technological know-how for competing in the global market. This will help the firms in KSA to take risk and to learn from experience and considerable trials and errors and try-again learning. Japan can be given as a very successful example in this regard. The creative imitations along with innovations helped Japan to become global economic giant within relatively shorter period of time after the World War II. By adopting and adapting advanced technologies from abroad, the Japanese firms excelled in their later stage by gaining access to newer technology and using them with more accurate understanding of the growing market than was possessed by the original innovators which is often termed as 'technological leapfrogging'. This similar pattern can be followed by KSA.

If KSA can successfully walk through the above three steps towards realizing a functional KBE, there will be greater job creation which can absorb the increasing number of skilled labor force in KSA. Thanks to the efforts of government to enhance the human resource

development in KSA. With such background, in 2006, the Saudi Arabian government announced the strategy for industrial development, titled as 'Vision 2020' with the aim to expand the nation's industrial competitiveness and diversifying the industrial structure through primary measures such as reinforcing Kingdom's industrial competitiveness, building the industrial development supporting program and infrastructure, and maintaining the rules and regulations for strengthening the competitiveness of industrial products in the market. Another important issue emphasized is the manufacturing business that can create new technology and is the core element that can induce growth and technical change in the fields of agriculture, finance, construction, and environmental management. This is an important essence for the growth of a KBE. In addition to the above-mentioned facts, the manufacturing business may quickly induce the accumulation of human capital (technology and ability) across the community as well as the aspects of individual or company, which could be one of the important elements in fostering manpower. This will enhance human capital management ability and technology and innovation ability through various training processes and thereby further advancing the growth of KBE in the Kingdom. 'Vision 2020' also focuses on reinforcing and expanding all the R&D activities in the national institute, corporate institute, and university, building an efficient "national innovation system" by strengthening the linkages between R&D and technology within the corporations, and promoting the small and medium enterprises (SMEs). One such area can be the automobile industry. The Kingdom has high potential in the automobile sector because its demand for automobiles is the largest in the Middle East, increasing by 10% every year, and the future prospect of growth seems very bright. However, the original technology level or production base is rather poor in KSA and therefore, the automobile and parts related industry did not develop as one would expect. But because of its high demand, the Kingdom can invite the automobile companies from various countries to establish manufacturing and assembly plants in the Kingdom. This would create tremendous positive impact in the technology level in the country. In this connection, the country can focus on the Japanese automobile companies as they possess world's most sophisticated technology to produce reliable, energy efficient and cheap cars. Furthermore, the social and cultural values of Japanese society are close to Kingdom's Islamic values. This would make technology and other exchanges between the two countries really smooth.

The Kingdom is in an advantageous position in terms of marketability owing to the heavy consumption in the Kingdom itself as well as in other Middle Eastern countries. The Kingdom can use this advantageous position to invite MNCs to establish their production base in the Kingdom that will help the country to get advanced technologies more easily. As the MNCs will bring new and advanced technology in, the domestic companies of the Kingdom will also reap spillover effects creating a potential for drastic technological leapfrogging for KSA. This would, in turn, create a lot of opportunities for skilled workers in the country which will be able to solve the current unemployment crisis in the Kingdom as well as create more job opportunities for the skilled foreign labor in the Kingdom which is not a case in the present day Kingdom as the country is heavily flooded with the low or

unskilled foreign workers.

In a recent study, OECD concluded that “international differences in the pattern of employment and unemployment depend to a significant extent on the capacity of national economies to innovate and to absorb new technology through structural change” (OECD, 1996). At the same time, there are growing concerns over how technology and trade affect the demand for workers with different skills and how they affect wages. The policy-makers of Kingdom must take these two points into account while designing the structural change that will bring down the current high unemployment rate.

7. Concluding Remarks

The analysis of the changes in the Kingdom’s economy shows that it is slowly shifting towards a KBE and the present structure of employment in KSA reveals that knowledge and innovation are increasingly critical to job creation. The country has experienced employment growth in manufacturing, high-knowledge and technology-intensive industries. That being said, the engine of employment growth remains in the service sector, with gains in employment coming from both high- and low-knowledge industries in that sector. Nevertheless, the findings of this study predict an increasing complementarity between knowledge and innovation, and employment growth in Kingdom’s industries. While knowledge and innovation are increasingly critical to job creation, the transition to a KBE has been slow in KSA. The evidence shows that the pace of structural change has not accelerated over the past 20 years and that knowledge-intensive industries still account for only a small proportion of total employment in KSA. There is a significant innovation gap in the country with its major trade partners. If, as contended in this study, employment is increasingly related to knowledge activities, it appears that closing the innovation gap will be critical to growth in productivity and employment, and hence to the future growth of KSA. In a parallel development, the findings of this study indicate that the demand-driven forces underlying the move toward the KBE – i.e., trade and technology – have resulted in increased adjustment in the labor market. The structure of labor market has shifted in favor of more skilled jobs as KSA is producing skilled human resources more than ever before. In this connection, KSA must introduce high skilled job by creating industrial hubs in the country where companies from both inside and outside the country will compete. The policy formulations must reflect the growing complementarity between trade and technology, and skills that will support necessary innovation infrastructure based on new technologies and increased trade. This will create the opportunity for improvements in productivity, employment, and incomes that is extremely essential in a KBE. In essence, the challenge for policy formulations in promoting employment in a KBE is to enhance the knowledge-creating capacity of the KSA economy by promoting investments in both innovation and human capital.

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サウジアラビアにおける現在の失業危機を解決するための 知識基盤経済の創造について

サウジアラビア王国の経済管理戦略は、近年、知識基盤経済（Knowledge-based economy: KBE）に焦点をあててきた。1973年の石油危機以降、同国は、知的労働者のスキルによるテクノロジーの開発に、焦点をあてる必要があることに気づいた。そしてこの考えに沿って、サウジアラビア政府は教育への注力、とくに石油に関係する教育や研究に力を注ぐことに強い関心を示すようになった。同政府が教育に注力していることを示す最近の例としては、アブドラ国王科学技術大学の創設が挙げられる。他の多くの知識基盤経済（KBE）の成功事例とはちがって、同国事例の特記すべきことは、スキルの低い地域において高い能力をもつ外国の人々が仕事で成功をおさめたという点である。その結果、スキルの低い低賃金の外国人労働者をも含めたそれらの地域では、多くの人々は十分に自分の知識のバーを上げることは出来なかった。サウジアラビアにおける近年の失業率の危機感は、このような知識の欠如により発生している。同国は、今後、高いスキルを持って大学を卒業する知識人材を輩出するために、そして、あらゆる階層の人々に知識が浸透していくように、広範囲にわたる知識基盤経済（KBE）の必要性に気づかなければならない。本稿では、いかにして同国が知識基盤経済（KBE）によって自国の経済体制を変革できるか、そしてそれにより、昨今の失業危機をいかにして持続的に解決できるかという点を論ずる。

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