Smart Development: Saudi Arabia's Quest for a Knowledge Economy

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Abstract
Nations that have sought to overcome the resource curse and other barriers to economic growth have sought, for some time, greater development through a number of strategies: from import substitution in the 1950s to current strategies based on micro-finance and human-capabilities approaches. Needless to say, the international community is still searching for the elusive Holy Grail of an optimal development strategy. One strategy that has attracted greater attention and a growing number of adherents is that of promoting the transition to a knowledge economy. This paper is about one such nation, Saudi Arabia. In analyzing the Kingdom's quest for a knowledge economy, this article hopes to shed light on the anatomy of the strategy itself and identify important preconditions for and barriers to the strategy's success. The case study of Saudi Arabia's quest for a knowledge economy carries important implications and lessons for other nations, especially those with resource economies that are seeking effective plans of economic development and transition.

Keywords
Knowledge economy, information economy, information technology, development, Saudi Arabia

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Introduction

As one of the richest countries in the world and G20 economies, the Kingdom of Saudi Arabia has been taking aggressive steps to break the long-established link between the fate of the Saudi economy and conditions in the global market for oil for more than a decade. But, even within the few highpoints of the oil age, and with revenues abundant, the Kingdom has found life in the oil age anything but trouble-free. Accordingly, the Kingdom has taken several strides towards economic diversification. In fact, abundant revenues often found a way to cause political and economic problems. Many economies dependent on natural resources have also found oil to be a 'curse' rather than a source of wealth that propels the country's economy forward. The Kingdom has come to look beyond oil to ensure a stable and vibrant economy, notwithstanding forecasts about the longevity of the oil age. The nation has firmly set its sights on transitioning to a knowledge economy, as reflected in the spending pattern of the Ninth Five-Year Development Plan that concludes by the end of 2014. The foundations of such a technological society are the benchmarks of the leading economies of the modern age. Saudi Arabia sees its economic future as unfolding squarely within such a development plan. It is this new age that the Saudis embrace as a means of escaping the instabilities of oil dependence, and arriving at a more prosperous and sustainable economic future. This article analyzes the prospects for success in Saudi Arabia's quest for this objective. It describes the nature of a knowledge economy, identifies the conditions within Saudi Arabia that favour the development of a knowledge economy, and identifies existing obstacles to such a development while proposing suggestions to overcome these obstacles. In marshalling these analyses, the article hopes to highlight important implications and lessons on the greater issue of economic development and transition.

The End of the Oil Age?

Daniel Yergin (2009 and 2011) has issued the most celebrated retort to the neo-Malthusian chorus of naysayers who have been proclaiming the end of the oil age. With the price of a barrel of oil reaching $147.00 in June 2008, the chorus gained greater volume with a cacophony of warnings about trends in supply, demand, and investment in the oil market. Yergin underscores the idea of an oil shortage as misguided, given that the Earth was sitting on 1.5 trillion barrels of reserves in 2009. Even more misguided, for Yergin, was the idea of 'peak oil' (that is, that the Earth has now arrived at its maximum potential in oil production). He avers that innovative technologies are not only finding substitutes for oil, but also creating the potential for greater discoveries; hence, we should see increasing production of oil well into the future. While he acknowledges that 'innovation' is leading the world towards a path of alternative energies, he does insist that we are not yet at a point where such sources are widely available, and hence 'oil is still the one'.

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Yergin insists that we can still comfortably rely on oil for some time without having to opt for new energy sources, the feasibility of wide-scale use of which is still not certain. But while Yergin appears Comucopian about the Earth’s short-term energy situation, he has continued to underscore the great uncertainty in the market for energy and the technologies that produce that energy. In some cases, he has identified possibilities for ‘disruptive innovations,’ which have the potential to bring significant changes to the market for energy. So, just as the scale and affordability of jet travel fundamentally altered the market for private and commercial transportation, the development of new and feasible technologies for energy have the potential to drastically change conditions in the market for oil. Moreover, many of Yergin’s arguments about the wisdom of depending on oil are founded on speculation. To use Yergin’s (2009, p. 93) own words when describing the likelihood of potential developments in alternative-energy technologies and their impact on the oil market, ‘in truth, we don’t know, and we won’t know until we do know’. Yergin, in fact, has not denied the potential for instabilities in the oil market, instabilities that would create a critical need to move towards alternatives. There is a consistent growing demand for automobiles in nations with populations of over one billion people (China and India). Oil companies have continued to be frustrated in the search for the next great ocean of crude. The environmental assault on the use of coal and oil has been pervasive and left a strong imprint on laws and economic regulation, creating increasing limits to the viability of their use. Both China and the US have staked an important economic wager on the profitability of alternative energy technologies, each competing to be the leading entrepôt for environmental innovation.

Oil companies have been reluctant to build new refineries because of the huge start-up costs and the uncertainty in the market for refined fuels (especially those companies whose refineries use more expensive grades of crude oil). Furthermore, oil companies themselves are working in tandem with automobile manufacturers to develop alternative fuels for greater integration between the markets for oil and transportation. These joint initiatives increase the corporate momentum towards the development of feasible alternatives in automobiles and complementary fuels. Finally, the integration of the markets for oil and investment has created the potential for greater instability in the price of oil, thus endangering prospects of long-term reliance on oil as a primary energy source. These instabilities hit both producer and consumer nations hard, as sharp variations in both oil revenues (for the producers) and energy costs (for the consumers) have had a crucial impact on the state of the economies and public finances for both sets of nations (Yergin, 2009, 2011).

Realizing that life in the oil age and extensive reliance on oil revenue is anything but trouble free, Saudi Arabia founded as early as 1975 the Royal Commission for Jubail and Yanbu to oversee the construction of two major industrial cities, Jubail (a port on the Arabian Gulf) and Yanbu (a major port on the Red Sea). The modern infrastructure of the two cities was built to support petrochemical industries and oil-intensive, heavy manufacturing industries through private investments. Yanbu is the site of the first world-wide and only

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Saudi–US dual-purpose all-solar powered desalination plant, while Jubail gained worldwide fame during the Second Gulf War. A year later, the Saudi Arabian Basic Industries Corporation (SABIC) was established to produce chemicals, polymers and fertilizers. Yet, the economy has remained fairly undiversified with oil continuing to dominate in a nation sitting on one-quarter of global oil reserves in a world still dependent on fossil fuels. Even in recent years, oil has still been 'the one' for the Saudi economy, accounting for up to 90 per cent of Saudi exports, 75 per cent of public revenues, and over one-quarter of the GDP. Saudi Arabia is the largest free market economy in the Middle East and North Africa (MENA) region, holding a 25 per cent share of the total Arab GDP; yet the Saudi economy itself is still under-diversified relative to other economies and even to MENA nations. Dependence on a commodity with such unstable prices has left its mark on the Saudi economy and public finances, with greater swings in the economic and fiscal standing of the nation relative to nations with more complex economies. In terms of the energy sector, there are also foreboding developments on the horizon. While oil sales have increased, the price of oil has declined in the first half of 2012 from over 100 dollars a barrel to under 85 dollars. Like many oil economies, the Saudis are plagued by some of the unfortunate effects of the resource curse. It will be difficult for an undiversified economy to pick up the slack caused by declining revenues from resource exportation. But even here, trends in Saudi energy use forebode a declining capacity to export oil even if production is stable. Energy use in Saudi Arabia has been increasing by 7 per cent a year. The Saudis presently consume 4 out of the 9 million barrels of oil that they produce daily. Extrapolating from these numbers, if nothing changes, then Saudi Arabia will be a net oil importer by 2035. It is, therefore, not surprising that the Saudis have been vigorously pursuing the development of alternative energy sources, including nuclear energy, through the relatively recent establishment of King Abdullah Atomic & Renewable Energy City.

The Saudi economy has endured an ongoing malaise, despite fairly stable oil production over recent years and the windfalls from the price of oil, which reached $147 a barrel in June 2010, and which remained at over $100 until 2012. Unemployment has remained over 10 per cent in recent years (close to the US rate), but with a higher youth unemployment (ages 20–24) rate. Demographic trends promise to make this problem even more acute unless addressed, as Saudi society is very young with 80 per cent of the population under the age of 30, 60 per cent under 20, and 40 per cent under 13 (the Saudi median age is 22). Moreover, recent trends show the population doubling every 20 years, which would mean the need for a very high and consistent economic growth rate in order to keep per capita GDP rising over that period. Even with such unemployment figures for Saudi citizens, a great many of the jobs in the Kingdom are still being filled by foreign workers (Gallarotti and Al-Filali, 2012; Gause and Jones, 2012; Jones, 2010; Lippman, 2012; Ramady, 2010; Saudi Economy, 2012).

Indeed, even if the oil age was far from over and Saudi Arabia enjoyed favourable conditions in the market for energy, life under such conditions would prove
difficult, as the history of economic instability for oil producers has demonstrated. Hence, the Saudis have been vigorously pursuing a new economic age for the Kingdom. The long-term plan for economic reform in the Kingdom issued by the Ministry of Economy and Planning (Ministry of Economics and Planning, 2005) encapsulates the vision and urgency of moving towards this new age of the knowledge worker, a knowledge society and a knowledge-based economy. The Ministry is pursuing an ambitious quest to double GDP by 2020 from the 2006 level through a transformation of the Saudi economy. The planners envision industrial diversification largely driven through education and private sector investment. According to the Ninth Five-Year Plan, half of the government’s spending will be dedicated to human resource development, which includes education and training, thereby reinforcing the Kingdom’s goal of creating a knowledge-based society (Ministry of Economics and Planning, 2010). The important long-term report of 2005, which maps out a development plan up to 2025 (Ministry of Economics and Planning, 2005), stresses the central role of the service sector. It says,

The services sector is expected to be the leading sector in the process of economic diversification during the strategy period due to international advancements in communications and information technology which will be applied in the service sector in the Kingdom. This role will be of more importance with the increasing attention to upgrading the innovative skills of scientific cadres in the Kingdom as well as enhancing the tourist sector and utilizing the geographic position of the Kingdom in providing services that enhance international trade and capital flows through international markets.

The Ninth Plan stresses the central role of knowledge:

The plan also encourages innovation in science and technology by providing $240 million in grants for research projects each year. Other initiatives include the establishment of 10 research centers, 15 university technological innovation centers in association with King Abdullah City for Science and Technology (KACST), and at least eight technology incubators at KACST and other universities. The government will also continue to promote university collaboration with international companies. (SBC, 2012)

There is, in fact, a pervasive emphasis throughout the Eighth Five-Year Plan (Ministry of Economics and Planning, 2005) on the crucial role of information and communication technologies (ICT), research, education, and innovation in all sectors of the economy. In short, the very lynchpin to the plan is the development of a vibrant knowledge economy in the Kingdom. The importance of a knowledge economy in the report is encapsulated in the following statement, which relates to planning for reform in the context of a global revolution in ICT: ‘The strategy will have to adjust not only its contents but also its speed to respond to this global information revolution’. In addition, the Ninth Five-Year Plan emphasized diversification of the economy horizontally and vertically, and expanding the absorptive and productive capacity of the economy in addition to building a knowledge society (Ministry of Economics and Planning 2010).

Saudi Arabia's Next Economic Age:
A Knowledge Economy

According to the first five-year plan published by the newly created (in 2003) the Ministry of Communication and Information Technology (MCIT, 2005, p. 4), the vision of the economic future of the Kingdom is based on

...a transformation into an information society and digital economy so as to increase productivity and provide communication and IT services for all sectors of the society in all parts of the country and build a solid information industry that becomes a major source of income.

The emphasis on this objective is based on faith in the potential of information technology and human development to generate a pervasive impact on national economies. Indeed, the extensive empirical findings on the association between knowledge (that is, education and ICT) and economic prosperity attest to the important role played by knowledge in economic growth and development (Ramady, 2010, pp. 396–400; 2005, p. 188; World Bank, 2007a). A major report issued by the World Bank in 2007, titled Building Knowledge Economies: Advanced Strategies for Development, concludes: ‘whatever their level of development, countries should consider embarking on a knowledge- and innovation-based development process. In these times of accelerated globalization, “grey matter” is a country’s main durable resource. Its exploitation for economic and social well-being is increasingly at the centre of development strategies’. The government has embraced this philosophy and, hence, has made it a priority to steer its economic evolution in that direction. The ambitiousness of the MCIT plan reflects the priority with which the government views a transition to a knowledge economy in its economic reform plans for the Kingdom: it has seven general objectives, 62 implementation policies, 26 specific goals and 98 projects. The seven general objectives are:

1. Raising the productivity of all sectors through the optimal utilization of information and communications technology (ICT).
2. Effective government regulation of ICT so as to assure its vigorous growth.
3. Building an internationally competitive information industry that becomes a major source of income for the Kingdom.
4. The optimum use of ICT at all levels of education and training.
5. Bridging the digital divide by enabling all of Saudi society to effectively use ICT.
6. The optimal use of ICT consistent with the civilizational mission of the Arabic language, patriotism and Islam.
7. The provision of individuals highly skilled in ICT through both training and the attraction of foreign expertise.

The idea of a knowledge economy goes back at least to the 1960s and the work of Peter Drucker. Drucker first introduced the concepts of knowledge workers and knowledge organizations in *The Effective Executive* (1966). Such workers and organizations produced 'knowledge, ideas and information'. This identification of knowledge as a specific factor of production introduced a new input into the theory of the firm, which until this time emphasized the value of only tangible inputs such as physical labour and non-human capital. Drucker went on to underscore and generate greater interest in the subject of the knowledge economy in *The Age of Discontinuity* (1969), where he devoted an entire chapter to the subject. His ideas would go on to create an impressive legacy, as the knowledge economy became a fixture in the pantheon of economic science’s central issues.

The knowledge economy (also called the information economy, knowledge-based economy, and knowledge society) represents what some consider the fourth stage in the history of economic development—from the agrarian or pre-industrial age (pre-nineteenth century agricultural sector), to the industrial age (nineteenth to mid-twentieth century manufacturing), to the post-industrial (mid-twentieth century—present—service sector), and finally to the information age (late twentieth—twenty-first centuries—knowledge, information technology, innovation and human capital). In reality, our present age is an amalgam of all four ages, as the global economy features all four basic models of economic relations. The knowledge economy in the fourth stage has an especially strong potential for interaction effects with the production models of the first three stages in that its components can have a pronounced impact on the state of the other modes of economic organization. Hence, the knowledge age may be the culmination of economic evolution in that it has introduced the principal means of guiding and co-ordinating all other forms of economic activity. As outputs, knowledge and information technologies have created entirely new markets. The products themselves serve multifaceted and pervasive uses in modern society. As inputs, they are the foundation of improved management, product and scientific innovations, increased efficiency in the production of goods and services and economic growth (Powell and Snellman, 2004).

There is much debate on the issue of the knowledge economy, from its nature (is knowledge more important as an input or as an output?) to its effectiveness as a means of economic growth and employment creation (which sectors are more knowledge-based than others? And how much do knowledge-based sectors contribute to productivity?). This article seeks to analyze the potential for the emergence of a knowledge economy in Saudi Arabia rather than resolve these debates about the knowledge economy per se.² Powell and Snellman’s (2004, p. 201) insightful analysis of the nature of the knowledge economy defines it as,

...production and services based on knowledge-intensive activities that contribute to an accelerated pace of technological and scientific advance as well as equally rapid obsolescence. The key components of a knowledge economy include a greater reliance on intellectual capabilities than on physical inputs or natural resources, combined

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with efforts to integrate improvements in every stage of the production process, from the R&D lab to the factory floor to the interface with customers. These changes are reflected in the increasing relative share of the gross domestic product that is attributable to ‘intangible’ capital.

The knowledge economy features a number of qualities that suggest a fundamental difference from the three economic systems that preceded it; hence, it is indeed a paradigm shift in economic evolution. First, it is far less influenced by time and space. Since the products and inputs are often intangible (information and skills), they can be created and used in almost any location at any time. Unlike tangible products, the components of a knowledge economy have no geographic or temporal restrictions. Second, the foundations of the knowledge economy are bound up neither in the application of human labour nor in that of non-human capital. Rather, they are driven by human capital formation. In essence, the principal chariot of production and value is neither physical toil nor machines, but human knowledge and ingenuity. Third, in preceding economic systems, education was bound up in the application of knowledge to specific modes of producing existing tangible products and services. In a knowledge economy, education is largely geared towards generating innovation, inventions, new products, and new modes of managing economic activity. Fourth, the knowledge economy is pervaded by non-rivalries in consumption. Since many of the inputs and products of the economy are intangible, they are subject to infinite and simultaneous use without depletion; hence, economic relations are much less plagued with problems of limited resources. This in effect changes the very nature of economic relations: economics is no longer about the production, distribution and consumption of goods and services in the face of limited resources. In many cases, the resources in a knowledge economy are unlimited. Fifth, this non-competing quality introduces another difference in the knowledge economy: there is far greater production of public goods relative to the previous three stages of evolution because knowledge is difficult to privatize. Once new ideas are born, they can be applied virtually everywhere. This would amount to a new kind of positive externality from economic activity: products and inputs, which are in the public domain.

Sixth, unlike the three systems that preceded it, shocks in the knowledge economy are endogenous rather than exogenous. The system is designed to generate shocks, while shocks occurred as a by-product in the previous systems. These shocks have a significant impact on existing markets: they produce a faster pace of creative destruction, that is, new ideas, products and management systems make existing ones obsolete in a faster and more comprehensive manner (think of how quickly mass air travel made other forms of transportation obsolete). The process of globalization has compounded the speed and destructive fallout of innovations. Hence, there is the possibility of very large rewards in the short-run with innovation, but the speed of dissemination often compromises the proprietary rewards from such innovation. Seventh, innovation is driven more by supply relative to former ages where demand was the dominant stimulant for innovation. Moreover,
demand in the knowledge age is much more a function of desire than need (unlike the previous ages where need played a greater role in encouraging innovation). Hence, demand for products and services in the knowledge economy tend to be somewhat more elastic relative to the demand for products in previous ages of economic development. The last two qualities create an economic system that is more dynamic and unstable relative to the economic systems of previous ages: change is inherent in the system; change generates fast and pervasive change in existing markets; and finally the rewards to innovation could be great but fleeting.

According to the World Bank (2007a, 2012), there are four fundamental pillars of a knowledge economy. These are described below.

Education and Training

An educated and skilled population is needed to create, share and use knowledge. (World Bank, 2012)

This is achieved through the development of a robust educational infrastructure: primary and secondary education, vocational training, higher education and lifelong learning institutions. In terms of development, knowledge economies have turned comparative advantage on its head: uneducated workers who fed low-wage economies will become more of a liability than an asset in a world where more developed human capital reaps the greatest rewards. Globalization amplifies this tendency as the market for ideas has fewer boundaries in a growing world market.

Information Infrastructure

A dynamic information infrastructure (television, radio, telephone, internet etc.) is required to facilitate the effective communication, dissemination and processing of information (and knowledge). (World Bank, 2012)

A knowledge economy thrives on a robust network of ICT. The economic aspects of ICT are pervasive across sectors: they represent a lucrative sector in themselves as well as an important input in the selling and marketing of other products and services. The potential for e-applications (that is, e-business, e-government and e-learning) is great. In terms of development, ICT is the foundation for the construction of a modern industrial economy. It has the potential to produce fertile leading industries for economic take-off more easily because the requirements for acquisition and operationalization of ICT are modest compared to those of traditional brick-and-mortar (that is, high start-up cost) industrialization.

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Economic Incentive and Institutional Regime

A regulatory and economic environment that enables the free flow of knowledge, supports investment in Information and Communications Technology ..., and encourages entrepreneurship is central to the knowledge economy. (World Bank, 2012)

In this respect, governments must eliminate both political and market distortions that impede the efficient application of resources that are required for a knowledge economy to thrive. Through appropriate laws and procedures, a viable regulatory regime would encourage robust entrepreneurship and investment in ITC, as well as effective management of ITC enterprises. Fundamentally, it is overwhelmingly clear from the evidence on the correlates of development that better government produces more prosperous societies (World Bank, 2007a, p. 25).

Innovation Systems

A network of research centers, universities, think tanks, private enterprises and community groups is necessary to tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new knowledge. (World Bank, 2012)

A pervasive network of institutions that process and generate information, as well as institutions that produce innovations are a necessary condition for a viable knowledge economy. Both public and private institutions will be the venues through which this clearing house of information and innovation operates—universities, laboratories, research centres, think tanks, private sector R&D and government R&D. Public support for this clearing house will be especially crucial for the following reasons:

1. The government can sustain initiatives that are not immediately profitable.
2. Government-sponsored innovation enters into the public domain more readily than innovation in the private sector.
3. Government innovation is more closely targeted towards general social needs relative to the more restricted priorities of private sector innovation.

In terms of development, developing nations will be especially dependent on government to set up such clearing houses because private investment in ICT and R&D is limited in those nations. Furthermore, such nations will also be far more dependent on information and technology that comes in through foreign direct investment. In this respect, developing nations with perspicacious governments that both invest in ICT and court FDI will find themselves in an advantageous position relative to nations that lack such governance.

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Conditions Favouring a Knowledge Economy in Saudi Arabia

Saudi Arabia is well situated politically, economically and socially to transition to a knowledge economy. In terms of the four pillars of a knowledge economy established by the World Bank (2012), it scores moderately high on the Knowledge Economy Index at 5.93, which ranks it 50th in the world. But the most significant statistical testament to its progress towards a knowledge economy is the fact that it has the best improvement in ranking among the 145 nations on the index. From 2000 to the present, it has moved up 26 spots in the ranking. The next biggest improvement is 18 years by Oman. Of the 145 nations ranked, fewer than ten nations had double-digit improvements in their rankings from 2000. Moreover, Saudi Arabia ranks fairly high specifically on the ICT score, which is especially important because it represents the information-technology infrastructure of a country. Its ICT score of 8.33 places it 21st in the world. In this respect, Saudi Arabia is one of the hardest-wired nations in the world in terms of information and telecommunications. It requires mainly an improvement in human capital to complement the technology: a more skilled and educated populace that is capable of innovating, and more perspicacious bureaucrats to create laws and regulations that encourage the development of the other three pillars.

Nevertheless, the Kingdom is taking steps in the right direction towards building high-value human capital compatible with the knowledge age. This is exemplified in several initiatives, including but not limited to the preparation and implementation of a plan for the future of university education commissioned by the Saudi Ministry of Higher Education in 2004 to advance the level of all the components of higher learning and to enable it to respond to the requirements for sustained development of the country. Commensurate with this initiative, the ministry established a set of concepts and steps for the implementation of a programme called ‘Afaq’ or horizons. The programme strives to provide the necessary information and analysis to develop a long-term plan for the university educational system over the next twenty-five years (that is, Afaq and the future of higher education 2005–2030) and to provide the principal milestones for developing staged plans for implementation during a five-year period. The process to implement this vital programme at the national level comprises two important initiatives: developing theoretical capability and developing implementation capabilities that involve application and training. The specific objectives of this project include an assessment of the scientific research needs in a knowledge-based society, an assessment of the realistic requirements of scientific research at universities, identification of the actual needs of active scientific research including tools for performance of high-level scientific research at Saudi universities and an estimate of the level, effectiveness and productivity of scientific research at universities in a knowledge-based society.

Furthermore, a government scholarship programme, implemented by King Abdullah in 2005, was instituted to provide an estimated 5000 young Saudis

opportunities for undergraduate and postgraduate studies at universities abroad for the 2007–2008 academic year. Saudi students received government scholarships for tuition and living expenses for up to four years. Students have mostly studied at universities in Canada, the United States of America, the United Kingdom, Australia, New Zealand, Switzerland, France and Germany. According to the World Bank (2007b), Saudi Arabia provides female students with one of the world’s largest scholarship programmes. By this programme, thousands of women have earned doctorates from Western universities. These efforts culminated in the founding of King Abdullah University of Science and Technology (KAUST) in 2009 as a public research university located in Thuwal, Saudi Arabia. KAUST focuses exclusively on graduate education and research, using English as the official language of instruction. It offers programmes in life sciences, engineering, computer sciences and physical sciences. In the lower levels of the education system, the King Abdullah Project for General Education Development was funded in 2009 to the tune of $2.4 billion over the budget of the Ministry of Education for six years to fund the transformation of selected public schools into a model of excellence in education similar to the magnet schools in the United States, in which the curriculum places great emphasis on excellence in science and mathematics. Extracurricular activities are directed towards developing intellectual, creative and communicative skills to create a skilled workforce for the future to build a knowledge society and economy. More than 400,000 teachers are being trained for the new programme.

To accelerate the transition to a knowledge economy, the Saudi government created the Saudi Arabian General Investment Authority (SAGIA) on 10 April 2000—an institution intended to promote and formalize the process of economic liberalization in the Kingdom. SAGIA plans to launch six ‘economic cities’ to be completed by 2020 to achieve the objectives of rapid and sustainable economic growth by creating a pro-business environment, providing comprehensive services to investors and fostering investment opportunities in key sectors of the economy with emphasis on ICT and knowledge-based industries. These six new industrialized cities are intended to diversify the economy of Saudi Arabia and, in doing so, are expected to make a significant contribution to increasing per capita income. The cities will be spread around Saudi Arabia to promote diversification for each region and their economy, and the cities are projected to contribute $150 billion to the GDP, compared to a contribution of $287 billion by the urban areas of Riyadh and Jeddah, by the year 2020. Over $60 billion has been allocated for ongoing construction in the four ‘economic cities’: King Abdullah Economic City, Prince Abdul Aziz bin Mousaed City, Knowledge Economic City and Jizan Economic City. All will have free trade zones, research centres and higher education institutions and advanced IT and media centres. A key component of the King Abdullah Economic City, for example, is the Educational Zone, which is intended to bring Saudi capabilities and aspirations in technology to globally competitive levels. The Educational Zone consists of a multi-university campus flanked by two research and development parks. The multi-university campus houses a
Science and Research Complex associated with Columbia and Thunderbird Universities and is designed to accommodate 18,000 students and a cadre of 7500 faculty and staff members. Similarly, the Knowledge Economic City (KEC), sited to the east of Al-Madinah (the second Islamic Holy city) will be a cultural landmark for visitors and a national centre for knowledge-based industries. Among the other zones are the Taiba Complex for Technology and Knowledge-Based Economy, technological and administrative colleges, theme parks, Islamic Civilization Studies Centre, a complex for medical studies, and biological sciences and health services.

Saudi institutions of higher learning have done much to enhance the development of knowledge centres. The major research centres and institutes at the Saudi universities are directing a substantial part of their R&D activities on issues related to building a Saudi knowledge society and providing the foundation of a strong Saudi knowledge-based economy with academic institutions as the prime motivators and managers. An example is the comprehensive research conducted by the Center of Strategic Studies at King Abdulaziz University, which has published over 44 documents under its ‘Knowledge Series’. King Abdulaziz University has also become noted for establishing the Wadi Jeddah Company, a university-owned organization focused on knowledge-based investments. Similarly, Riyadh Techno Valley (RTV) is one of the contributions of King Saud University (KSU) in building a partnership between the public and private sectors in the area of knowledge economics. KSU is seeking to play a full part in this strategy through the development of a substantial science and technology park, ‘Riyadh Techno Valley–King Saud University (RTV–KSU)’, on its Riyadh campus. Through this project, KSU aims to satisfy the demands of knowledge-based industries, and to commercialize its research findings, in addition to enhancing the research environment and encouraging researchers and graduates to participate in business incubation programmes and establishing spin-off knowledge-based companies. Also, King Fahd University of Petroleum and Minerals (KFUPM) recently established Dhahran Techno-Valley (DTV), a business cluster located in Dhaharan, to attract research and development centers of local and international companies and to promote new businesses. It is envisaged as a leading research and technology development nucleus with comprehensive business support. DTV includes the King Abdullah Science Park (KASP), an innovation center at KFUPM, a liaison office, business incubator, industrial consulting office and a science and technology exhibition Scitech (Abulfaraj 2006; El-Saqqaf, 2006a; Tayeb, 2007).

The pattern of economic development programmes and concomitant spending clearly indicates that the government is committed to an economic transformation that will create a more fertile environment for the growth of innovation, technology, and human capital. Since the beginning of the 5-year economic planning system undertaken by the government, we see a significant shift from infrastructural and economic resource development in the first two plans (the 1970s) to a greater emphasis on industrialization, diversification, social and health services, human capital development through education and training, and private investment over

the next seven plans. If we look at government expenditures on economic development over the nine plans, we see expenditures on infrastructure declining from 41 per cent during the third plan (1980–84) to 14.7 per cent in the current plan (2010–14). Over the same period, expenditure on resource development declined from 30.7 per cent to 15.7 per cent. Conversely, expenditure on human resource development increased from 18.4 per cent to 50.7 per cent and expenditure on social and health development increased from 9.8 per cent to 18.9 per cent. The present government of King Abdullah has embraced this development strategy over the longer run with its *Long-Term Strategy, 2025*—to transition over 20 years from a homogeneous economy founded on resource extraction to a modern industrial and knowledge economy (Ministry of Economics and Planning, 2005). This modernization is being stewarded by King Abdullah’s ambitious economic reform of the Saudi economy. In the *Long-Term Strategy, 2025*, the Saudi government has proclaimed the following targets:

1. A doubling of GDP.
2. Raising the investment component of GDP from 20.5 per cent to 33.9 per cent.
3. Decreasing the consumption component of GDP from 69.6 per cent to 55.1 per cent.
4. Increasing the private investment component of GDP from 15.4 per cent to 30.7 per cent while reducing the public component.

The share of both imports and exports as a share of GDP is expected to decline slightly as higher growth in GDP is expected to outpace the increase in trade (which suggests greater domestic sources of economic growth). Oil and gas exports are expected to decrease by about half, from 71.7 per cent to 36.7 per cent of total exports. Concomitantly, the share of non-oil and gas exports is expected to increase from 20.7 per cent to 53.7 per cent. The industry’s share in GDP will be increased from 19.6 per cent to 24.9 per cent. The oil sector’s contribution to GDP is expected to decrease from 27.5 per cent to 17.9 per cent, while that of the non-oil sector is expected to increase from 72.5 per cent to 81.1 per cent of GDP. The contribution of the service sector to GDP is to be increased from 27.4 per cent to 41.9 per cent and that of the private sector from 52.3 per cent to 69.3 per cent of GDP. The ratio of savings to GDP is targeted to rise from 39.8 per cent to 45.6 per cent. Labour participation rate will be raised from 36.9 per cent to 56.3 per cent of the population (this reflects an increase in the participation rate of women from 10.3 per cent to 30 per cent of the Saudi workforce); the workforce will be increased from 8.55 million to 15 million while the foreign workforce will be decreased from 4.7 million to 3.2 million (that is, Saudiization). The percentage of university graduates in the workforce will be increased from 27.5 per cent to 44 per cent. These targets convey a strong desire to move out of the early stages of economic development based on harvesting raw materials to more advanced stages. A prevalent theme in the language of the Ministry of Economics and
Planning development plan (2005) is that success in achieving these targets and thus transforming the Saudi economy lies in establishing the foundations of a knowledge economy. Such references in the report are pervasive: ‘high skilled and well qualified labour’, ‘scientific cadres’, ‘advancements in communications and information technology’, ‘economic diversification’, ‘educational attainment’, ‘high degrees of skill and specialization’, and ‘human development sectors’ (Ministry of Economics and Planning, 2005; Ramady, 2010).

The economy of Saudi Arabia is strong and favourably positioned to achieve such goals. While growth has been uneven due to changes in the price of crude oil, it has been robust with consistent, positive growth rates over the past several decades. The nominal GDP of the Kingdom has roughly doubled since 2005. King Abdullah has announced that the per capita income is forecast to rise from $15,000 in 2006 to $33,500 in 2020. Saudi Arabia is one of a few fast-growing countries in the world with a relatively high per capita income of $24,200 (2010). Over the past five years, consumer spending has more than doubled; bank deposits have almost doubled to 1.1 trillion SR; inflation is down from 9.9 per cent to 4.9 per cent; non-oil exports and total imports have both grown by about 40 per cent; the fiscal state of the Kingdom has been robust with yearly budget surpluses greater than 12 per cent of GDP in three of the last five years. In the non-oil sectors, the income generated by the service sector has increased by about 30 per cent, while the income generated by the manufacturing sector has increased by 25 per cent. In the first decade of the new century (2002–2010), crude oil production has remained strong and consistent, with Saudi Arabia’s share in world production staying consistently at about 10 per cent and total production averaging over 3 billion barrels per year. Crude reserves have remained steady at about 294 billion barrels, while world demand for oil (at about 85 million b/d on average) has risen slightly. Even with the current decline in the price of crude in 2012, the price of crude in current dollars is four times greater today than it was in 1999; so, oil revenues have been quite robust over that period. The current account surplus has been strong and consistent, averaging about 20 per cent of GDP, while the capital account deficit declined from 22.4 per cent to 9.4 per cent of GDP from 2006 to 2010. Bank lending to the private sector has increased strongly and consistently over the past two years, growing at a yearly rate of 13.5 per cent in April of 2012. The Tadawul All Share Index (TASI) increased from 5500 in March 2011 to 7900 in March 2012. The number of factories increased from 3484 in 2004 to 4878 in 2011. And, unemployment is down from 12 per cent in 2006 to 10.5 per cent in 2012 (Gamble, 2012; Ministry of Economics and Planning, 2011).

In terms of infrastructure, the Kingdom has shown promising outcomes in the first decade of the new century (2002–2010) that are conducive to the advent of a knowledge economy. The demand for electricity has approximately doubled; the area of paved roads has increased from 43,000 to 58,000 kilometres; railway tracks have been expanded with significant increases in the number of passengers carried (from 714,000 to 1,124,000 people) and freight transported (from 165,000
to 4,005,000 tons); the activity at both commercial and industrial sea ports have shown large increases, from 43,526,000 to 80,252,000 tons at commercial ports and from 60,710,000 to 73,773,000 tons at industrial ports. In civil aviation, the number of flights increased from 261,900 in 2002 to 430,500 in 2009; the number of air passengers increased from 31,707,000 to 48,022,000 in the same period. In telecommunications, the number of fixed telephone lines increased from 33,170,000 in 2002 to 41,061,000 in 2010; the number of mobile phone connections increased tenfold from 5,008,000 to 51,600,000 in the same period, which is equivalent to two connections per person in the Kingdom; the number of internet users increased from 2,360,000 in 2004 to 11,400,000 in 2010. In terms of manufacturing these products, the number of factories that produce electronic machinery and apparatus increased from 86 in 2004 to 135 in 2011. The number of broadband subscribers increased from 35,000 in 2004 to 4,400,000 in 2010 (Gamble, 2012; Ministry of Economics and Planning, 2011).

Socially, the Saudi population is large and very young (figures cited above). While the youth of the nation presents a challenge for the economic future of the Kingdom, it also carries significant advantages for ushering in the advent of a knowledge economy. Young Saudis are better adapted to the highly educated and cosmopolitan world that serves as a breeding ground for the skills and technologies upon which information-based economies are founded. The government plan to enhance human capital development in Saudi Arabia goes back at least to the 1990s. Saudi youth are very well educated with almost full enrolment rates at the primary and secondary levels of education (with 93 per cent women enrolment at the secondary level as of 2010). Enrolment in higher education is strong with 36.6 per cent of males and 37.3 per cent of women enrolled at institutions of higher learning. While total enrolments in primary education remained fairly steady in the first decade of the new century (2002–2010), between 2,316,200 and 2,493,100, the enrolments at the secondary level and in higher education increased dramatically from 842,200 to 1,146,600 and from 448,800 to 903,000 respectively. The number of graduates from institutions of higher education increased from 76,300 in 2002 to 115,800 in 2009. In terms of the quality of education, we see a decline in student/teacher ratios across all three levels in the same period: from 11.6 to 11.2 in primary education, from 11.6 to 10.1 in secondary education, and from 12.9 to 11.0 in higher education. Enrolments in the Institute of Public Administration increased from 21,884 to 50,503, while graduates of the Institute rose from 19,715 to 49,440. Enrolments in technical training institutes increased from 30,060 to 84,737, while graduates increased from 5074 to 20,415. Enrolments in vocational schools declined from 22,647 to 16,262, but graduates of vocational training rose from 4818 to 8387. A stronger educational system may be the most important means of promoting Saudization, since Saudi citizens qualified for high-skilled positions will have a competitive edge over foreign candidates in both domestic and foreign firms. Moreover, the Saudi government continues its generous funding of free higher education and sending Saudi students abroad (Bremmer, 2004; Ministry of Economics and Planning, 2011).

In essence, the demographics of education are testament to the success of an ongoing initiative on the part of the government to address a historic shortfall in the development of human capital. The manifestation of this shortfall has shown a dearth of Saudi youth filling high-skilled positions—hence, the need to bring in foreign labour to fill job vacancies. While the education system of the past promoted a preparation for ‘luxury’ rather than high-skilled jobs, Saudi citizens have faced a situation in which foreign nationals have been displacing Saudi youth in the market for jobs requiring high levels of human capital development. Saudi Arabia is not unique in this aspect. Most countries, including highly industrialized countries, import needed specialized skills as long as the domestic labour market suffers from shortage in supplying such skills. This is not different from importing the material or equipment needed to boost production. In reality, many countries entice highly qualified individuals to join their work force because either the human development of their specialized skills will take a long time or the cost will be prohibitively high. Although some institutions tend to resort to hiring foreign nationals as a low-cost alternative to citizens with the same skill level, the gap in skills may be manifested also in higher wages for foreign-high-skilled labour. Furthermore, Saudi Arabia as a member of the World Trade Organization (WTO) and signatory of the General Agreement on Trade in Services (GATS) has a competitive labour market. Within this prevailing environment, the Ministry’s (2005) 20-year plan seeks to encourage vigorously human development to enhance the process of Saudization. Furthermore, the increased successes in vocational and technical training have helped mitigate a major distortion in the market for labour that has plagued the Kingdom: skill mismatches, that is, too many advanced degrees and too few artisans or technicians with trade skills. The evidence from across nations regarding differences between high- and low-skilled employment suggests that there is a significant ‘education’ premium earned in high skill jobs. But there is also more job security in high-skilled jobs with respect to redundancy: technology is more likely to replace low-skilled workers than highly skilled workers. Moreover, the findings on fast-growing small and medium enterprises (SMEs) suggest that it is these economic ‘gazelles’ that provide one of the major solutions to the problem of employment in MENA nations. Not surprisingly, these gazelles tend to reflect a strong knowledge-based profile: more high-skilled positions, more employees with advanced degrees, innovators, the offer of more training programmes, use of more multimedia technology, etc. In light of this association, Stone and Badawy (2011, p. 4) state: ‘These findings direct policy attention towards education, training, quality systems, telecommunications systems and computer literacy, and competition policy (understood broadly) as key focal points for a strategy to promote SME-based employment growth’ (Looney, 1991; Ministry of Economics and Planning, 2011; Powell and Snellman, 2004; Ramady, 2010; Stone and Badawy, 2011).

Politically, the most recent thinking on development, which is founded on a ‘human capabilities’ approach, stresses the importance for political agency as a necessary condition for economic transition to higher stages in the ladder of
economic evolution. The type of knowledge and industrial economy that the Kingdom is seeking will indeed require such agency to enhance the process of human capital formation and the growth of a private sector. Just on the issue of women’s employment alone, success in Saudization will in great part be driven by greater participation of women in the workforce as Saudi women displace foreign workers who were not as easily displaced by Saudi men. To circumvent social impediments to and the logistics of women’s participation in the Saudi workforce, the Center for Strategic Studies at King Abdulaziz University conducted an in-depth analysis of the situation and have developed the means to facilitate the transition of university graduates to the labour force. Extensive studies were also conducted on the provision of job opportunities particularly suited for young women within prevailing traditions and social norms (that is, designed to have limited impact on women’s role as wives and mothers). A case in point is taking advantage of the advancement in technology that supports telework: a spreading mode of work performance that saves energy and space, which is being adopted around the world by major companies and organizations. Telework allows young mothers in their child-bearing years and homemakers to use their education and training to contribute to the economy while being able to care for and nurture their young children. Further, job opportunities are likely to develop with the advent of e-universities, e-learning and e-commerce as presented in a comprehensive study of ‘the role of e-commerce in the placement of graduates of women’s colleges in the Kingdom of Saudi Arabia’ (El-Saqqa, 2006b). The present ruling regime of King Abdullah has embraced this association between agency and economic development in pushing for historic reforms in the Kingdom. The creation of a National Dialogue, establishment of human rights commissions, the fight against corruption, and educational, legal, political and social reforms have gone beyond the nominal institutions of political agency embodied in such things as the Consultative Council (Majlis Al-Shura) system (that is, political venues through which people can marshal a political voice) and have demonstrated a commitment to modernization in a more liberal direction. Furthermore, there is much generational momentum in compounding this reform movement, as many of the King’s grandsons are themselves products of modernity, and a number of their spouses have even taken up social causes. Saudi society, like those of the Arab Spring nations, is seeing the increasing manifestation of political agency at both the grassroots and organizational levels. Lippman (2012, p. 36) cites an extensive study on reform in the Kingdom undertaken by a group of experts on Saudi Arabia, and highlights the finding that Saudi Arabia is indeed moving towards a ‘liberalized autocracy’ (Deneulin and Shahani, 2009; Gallarotti and Al-Filali, 2012; Gause and Jones, 2012; Lippman, 2012; Ramady, 2010; Riedel, 2011).10

In terms of the social conditions for a knowledge economy, the principal issue revolves around interfacing a modern knowledge economy with a traditional religious culture. The Arab Spring has suggested that the two are not as diametrically opposed as some might think. But it was certainly also the case that the Spring was to a large extent the result of the lack of economic opportunities for highly

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educated segments of the respective populations. Can a traditional culture co-exist with a modern society, and accommodate its economic needs? In effect, the modern Kingdom of Saudi Arabia, throughout its history, has proved that in fact such can indeed be the case. Many have cited the important role played by vast oil revenues as a means of purchasing political and social stability in the face of modernization. But in fact the Kingdom’s most important asset in bringing these often conflicting forces into a peaceful co-existence has been its domestic ‘soft power’, deriving from its religious status and the ruling family’s political support.11 In fact, the duration of the golden age of the Saudi distributive state has been all too brief and intermittent. The highpoint of oil wealth was in the 1970s, but since then (up until the oil-price boom in recent years), the Kingdom has been anything but an infinitely rich nation that was capable of spending itself out of political, social and economic difficulty. The Al Saud, in fact, has been the principal source of modernization in the Kingdom. Such success in modernization owes much to both the veneration of the ruling family itself as well as the sanctity of the religious connections that the family has drawn between the Kingdom’s progress/reforms and Islam.

Challenges for Future Planning

Saudi Arabia is well on its way towards a knowledge economy, as its track record bears out. Already, the Kingdom has made significant achievements in economic diversity, quality of life, and education. This success has been the outcome of, as articulated above, a number of favourable conditions in the Kingdom that have created a nurturing environment for economic transition. However, there is still much work to do and many hurdles to overcome economically, politically and socially (The Economist, 2012). The Ministry of Communications and Information Technology’s ambitious goals (2005) are still far from realization. While economic diversification towards a knowledge economy is at present underway, the emphasis of government policy needs to continue to be on developing internationally competitive industries. It is within these industries that the market for innovation and technology flourishes. The failure to invest in such industries, both from private and public sources, has created one of the most significant barriers to economic transition in the Kingdom. To a large extent, Saudi Arabia is still being victimized by the resources curse.12 Notwithstanding the major goal of developing the private sector in the Kingdom, the public sector is still large. Government ownership of industry in the Kingdom is still significantly high in comparison to the Organisation of Economic Cooperation and Development (OECD) average. Foreign direct investment is still relatively moderate, having remained on average under 8 per cent of GDP over the past decade (and actually experienced a significant decline after 2008). Financial markets in the Kingdom still remain moderate in depth and size compared to other economies; hence indirect investment has also not been as much as economic planners had hoped.

for. An important precondition for growth in investment and private industry is structural reform: a stable economy, a strong regulatory system, and a competitive environment (World Bank, 2007a, p. 52). But such reform has not progressed at the desired pace. Other more specific conditions like the absence of a reliable value system for the sale of public assets, rigid wage structures and unfavourable corporate tax structures have held back the growth of the private sector. The government has also historically emphasized the localization of labour, which militates against efficiency because it produces regional gaps in filling high-skilled labour (that is, less skilled local workers are employed in lieu of more skilled workers from outside the communities). The government has to continue to reduce distortions in the market for labour. One major problem has been rapid urbanization, which has depleted human capital available in rural areas. This depletion has been caused by greater government spending on urban bureaucratization relative to rural bureaucratization.

Another major problem is the still large number of government workers in the Kingdom, a historic means of reducing unemployment in an undiversified economy (Ramady, 2010; Loney, 1991; Lippman, 2012). In terms of regional development, the present emphasis on urban and suburban development must continue, but not at the expense of neglecting rural development. A developed rural sector goes hand in hand with modernization and economic development. Rural industries are also prime candidates for knowledge economies: technical expertise in agriculture, rural-based telecommunication and information ventures, etc. Saudi Arabian rural areas have historically been a victim of a vicious cycle of deprivation and exodus. This is no different from the case in most developing countries where industrialization has led to the neglect of the rural sector. In fact, isolated and scattered rural areas in some of the major industrial countries suffer from migration to industrial cities whenever there is an imbalance between job opportunities in urban and rural areas. Accordingly, the ministries of agriculture in many developing countries seek innovative ways to create job opportunities in rural societies and encourage SMEs to vitalize the rural economy. Since public and private investments are concentrated in urban areas, the rewards to educated youth in rural areas have been limited, leading to an exodus to cities. Reversing this cycle through a vigorous investment programme in rural areas would create more even economic development geographically, thus mitigating migratory flows that are economically and socially destabilizing. One model for regional development, which has been implemented on a wide scale in Saudi Arabia, is establishing special economic zones (SEZs) with few bureaucratic entanglements, lower tax burden, and limited transaction costs (for example, technology parks). As entry points for ICT ventures, these economic start-up projects are important catalysts for integrating national ICT markets and promoting general growth (World Bank, 2007a, p. 52).

As is being realized by Saudi scholars and educators alike, education is the catalyst to generating the change that will provide a fertile ground for an economic transition to higher stages of development in the Kingdom. To quote
Bremmer (2004, p. 29), 'The long-term success of reforms in the Kingdom depends on the emergence of a citizenry capable of playing an informed and active role in their society'. Education must continue to be expanded and rationalized. Greater emphasis on innovative and critical thinking relative to memorization of texts must be the underlying pedagogical objective of Saudi education across differing levels of learning. There is still a gap between the demand for labour and the system of education in the Kingdom. The education system still promotes non-technical higher education degrees that are best suited for government employment. The gap between the job market demand and the educational institutions’ supply can be eliminated through co-ordination of admission to different colleges, whether this is done nationwide as in Saudi Arabia or selectively by the different academic institutions through restricting admission to specific specialties as in the United States and European Union countries. However, often the time lag between admission and graduation is enough to change priorities in the job market, resulting in a mismatch between demand and supply of the workforce. In order to effect this reform, curricula in secondary and higher education require an expansion of engineering, sciences, IT, and medical training. The expansion of vocational training and distance learning should also be priority areas.13

The creation of applied research institutions should be another major goal of education reform. The Kingdom has taken several steps towards achieving this goal by transforming major Saudi universities to research universities, in addition to establishing university-based research centres.14 Since private institutions are more internationally competitive and likely to promote knowledge-based learning than public institutions, Saudi Arabia ought to encourage establishment of private learning institutions at all levels of education. Nevertheless, this may not be possible at this time since the current public education system is free. However, as a member of the WTO and signatory to the GATS, Saudi Arabia will have to allow foreign universities to have branches in the Kingdom and open the doors for investment in universities.15 The economic cities under construction, such as King Abdullah Economic City, could be fertile sites for foreign universities. Moreover, in lieu of privatization, public institutions should become more independent in management and staffing practices. Academic independence is critical especially for research universities and associated research centres. Such an objective will also promote a more efficient educational system at all levels. This requires initiatives that create incentives for highly qualified individuals to become and remain teachers. It is also important to enhance the availability of seats and enrolment in rural educational institutions, an environment that has historically failed to generate high participation rates in primary and secondary education. Effective primary and secondary education has proved to be the foundation for creating a vibrant middle class, which itself is a necessary condition for a modern industrial economy. In some cases, this means a greater reliance on Westernization strategies, and a more efficient reallocation of indigenous resources (Al-Filali, 2012; Bremmer, 2004; Looney, 1991; Ramady, 2005, 2010).

With respect to specific sources of the knowledge economy, the Saudi performance has been somewhat uneven. In terms of developing communications networks, the accomplishments have been commendable. Saudi investment has reached global media sources such as Fox News and Twitter. Moreover, the government has created science parks that collaborate with universities, and has created technology parks and industrial cities in Jeddah, Riyadh and Dhahran. In addition, the establishment of King Abdullah University of Science and Technology stands as a landmark testament to the government’s commitment to a new technological society in the Kingdom. However, in other areas, the performance has not been up to par. This is the case with respect to think tanks, patents and the publishing industries—also principal foundations for a knowledge economy. The findings of the *Global Think Tank Report of 2011* show Saudi Arabia as having just four think tanks in a world with over 3000. Only three MENA nations actually have fewer: One in Libya, two in Oman and three in Bahrain. MENA nations as a whole boast of 329 think tanks. Moreover, Saudi Arabia has no think tank among the MENA top 30. In terms of patents, from 1977 to 2011, Saudi Arabia ranked 45th globally in terms of the number of total patents acquired (443)—behind Greece, Bulgaria, Malaysia and the Philippines. This is excluding patent applications filed in the Saudi Patent Office (established in 1990) under the administration of the King Abdulaziz City for Science and Technology and the GCC Patent Office (which became operational in 1998), where applications are filed and issued in Arabic. The United States, by comparison, has 2,433,535 patents. Every individual state in the United States, in fact, has more patents to its credit than the entire nation of Saudi Arabia. The American state with the fewest number of patents is Alaska with 1327 filings, three times the number of Saudi patents. In terms of the percentage of population with tertiary education and national investment in knowledge as a share of GDP, Saudi Arabia still ranks outside the top 20. Accordingly, the Kingdom launched an extensive campaign to encourage Saudis to register their innovations. The Saudi government and universities provide financial and status-based incentives to inventors to facilitate submission of patent applications. For example, the King honours those who obtain patents. In the area of publishing and printing, we have seen only a modest increase in the number of factories from 108 to 117 in the last seven years. Traditional publishers in the Arab world tend to congregate in one of the major cities. Cairo (Egypt) maintained its status as the publishing capital of the Arab countries and the Muslim world until the 1960s, at which time Beirut (Lebanon) became the major publishing hub in the Arab World. Such concentration of publishers in one place has been dismantled gradually. As much as the Kingdom has become more hard-wired, it still lags behind even some Gulf States in the use of information technology. The Kingdom lags behind the UAE and Bahrain in mobile phone and internet users, as well as in computers per household. To overcome this shortfall, universities are examining the situation and providing solutions to bridge the digital divide, and the Saudi government is promoting programmes to spread the use of internet and computers. One such


An important gateway to the process of economic take-off into an information economy would be the energy sector. It is, after all, the sector in which the Kingdom has long enjoyed a strong competitive advantage. Over-diversification of the Saudi economy would be a mistake, since there are a plethora of platforms in the energy sector that have the potential to develop knowledge-based elements. In trying to get away from an energy economy, planners must be careful not to 'throw the baby out with the bath water'. Needless to say, at present, Saudi industry is best developed along all the differing phases of energy production, from upstream to downstream. All state-run energy-based companies are integrated fully internationally with foreign companies. It is here that the economy has amassed its greatest storehouse of knowledge-based capabilities. In this respect, oil itself can turn into gold in terms of the international demand for expertise in extracting and refining oil products. Besides, there is a natural spin-off benefit based on integrated expertise with other energy industries such as natural gas, petrochemicals, power generation, water desalination, alternative energies and mining. These other energy industries are indeed being increasingly developed, but the emphasis needs to be more on developing the informational and technical aspects of the industries, rather than on the value of the energy output to the Saudi economy. The opportunities are especially great since Saudi Arabia is still a crucial international energy hub, and it can use its commercial influence to become the most important international entrepôt for information and consulting services on all types of energy and resource extraction industries. Since the energy sector is pervasive in the Kingdom, its information-based growth promises to have the greatest impact in terms of positive externalities for other sectors, and hence has the greatest potential to be a catalyst industry for general economic development.

There is also significant spin-off potential in the Kingdom’s energy sector for clean energy technologies. Forecasts of global patterns in the use of energy suggest that clean energy technologies and expertise will be in great demand as this growing industry is being foreseen as the principal economic driver in the near future. Moreover, clean energy technologies naturally open up subsequent spin-off opportunities in new environmental industries, which are also among the most promising future industries. Even President Obama has embraced clean energy as a critical component of the future US economy.

The rich history of Saudi Arabia's involvement in renewable and clean energy research, technology and industry goes back close to half a century. A highpoint in this process was manifest in the Launching of the Solar Energy Research American Saudi (SOLERAS) programme in 1977, when scientists and experts in renewable energy technology from both sides participated in research and development and US-Saudi joint ventures, and large and small companies carried out

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competitive projects from design to operation. The programme was administered by the Solar Energy Research Institute (SERI)7 of the US Department of Energy and the King Abdulaziz City of Science and Technology. The administration of the programme was transferred after the end of the Carter administration to the Midwest Research Institute (MRI), Kansas City, Missouri. The SOLERAS programme brought to the forefront commercially viable renewable energy equipment, devices and systems, which existed in the past only as concepts. Among the projects completed by the programme are a solar greenhouse, a solar desalination plant, solar powered traffic signals, cooling laboratory, a solar powered city in Saudi Arabia and solar electric power generation in the US. The Saudi energy sector is primed to expand into specific growth areas comprising clean energy, end-use energy efficiency, emerging technologies, demonstration and deployment programmes, and commercial technologies. Other Middle Eastern countries have already embraced the spin-off potential of resource extraction as spending on clean energy in the region has increased dramatically in the past decade (Ranady, 2010; Shihab-Eldin, 2009).

Politically, King Abdullah’s political reforms have put the Kingdom on a path to greater political and economic empowerment for the entire Saudi society. As noted, there is a very strong association between such empowerment and economic development. Both interact to reinforce one another, but a strong necessary condition for a modern economy with a prosperous middle class is indeed a society that has been empowered both politically and economically. The empowerment of women is especially important. Women in the workforce will enhance Saudization at all skill levels, but they are especially poised to fill knowledge-based jobs that the economic reforms promise to create. Women in the Kingdom own large amounts of wealth, enjoy extensive commercial proprietorship, and their enrolment in higher education is greater than that of men.18 A total of 636,245 (268,080 male and 368,165 female) students were enrolled in higher education in 2006: 528,146 students (187,489 male and 340,657 female) were in Bachelor programmes, 9768 students (3551 male and 4217 female) were in Master programmes, and 2410 students (1293 male and 1117 female) were in PhD programmes (Ministry of Economics and Planning, 2008). Furthermore, in 2006, the gross enrolment ratio for females was 36.1 per cent, the gross enrolment ratio for males was 24.7 per cent, and the total gross enrolment ratio was 30.2 per cent (World Bank, 2008). Much is changing to give women greater social, economic and political power. We see an increase in female employment across a cross-section of the labour market, which had traditionally been filled only by men, with women having historically worked either for the government or in education. Special institutions for the technical training of women have been constructed. But even under the present restrictions on the economic empowerment of women, information services are well adapted to their employment. Such jobs allow women to work from home besides insulating them from workforce demographics, that is, women can effectively do their jobs without having to share offices with men. Empirical studies on the effects of economically empowering women

definitively attest to the great potential such economic and political empowerment has for growth and development within their greater economies (El-Saqqaf, 2006b; Jacobsen, 2011; King et al., 2008; Ramady, 2005).

With the abundant soft power enjoyed by the Al Saud family because of both its political and religious status, the royal family draws significant support from Saudi society to carry on its reforms in the long- and short terms. This requires the continuation of conceptualizing and articulating its reform strategies in the context of Arab culture and Islamic values. The most venerated scriptures of Islam contain a significant amount of content that is consistent with the acquisition and spread of knowledge, modernization, economic growth, and economic empowerment for all groups and both genders. Indeed, modernization is most compatible with national culture and religion. Ultimately, the royal family should continue doing what it has done best: promote modernization within the Kingdom’s prevailing religious and cultural principles (Gällarotti and al-Filali, 2012; Nehme, 1994; Ramady, 2010).

Conclusions: The Need for Economic Reforms, and the Promise of a Knowledge Bourse

The Saudi government is strongly committed to a transition away from a resource economy founded on oil. Even if the oil age continues and oil nations continue to prosper, life in the oil age has proved difficult even when revenues were abundant. Indeed, the Kingdom has set its sights squarely on joining the ranks of nations that embrace the potential of a knowledge economy. Ultimately, however, it behooves the Saudi government, as well as other governments that are seeking a similar economic transition, to spare no expense or tolerate any delay in bringing this transition about. The transition cannot be fast enough, as early government spending on developing a knowledge economy will diminish the need for later spending as the transition becomes self-perpetuating. The greater the upfront investment, the lower will be the total expenditure over the long run. Besides, there is a competitive element involved, as early knowledge economies become international hubs whose growth is more self-reinforcing, while the laggards fall further behind. Hence, the rich get richer and the poor get poorer in the international market place for information and technology. In this respect, there is a strong ‘first-mover’ benefit in transitioning to a knowledge economy. As Powell and Snellman (2004, p. 214) note:

Technological advance, like many aspects of economic and social life, is often characterized by a feedback process in which early success is heavily rewarded. Just as more educated workers are garnering the lion’s share of gains from the knowledge economy, both specific institutions and regions that were ‘present at the founding’ capture increasing returns from the knowledge economy... In the intensely competitive realm of basic science and technology transfer, positive feedback and increasing returns are enjoyed

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by early entrants, while institutions and regions that did not have a hand in the initial discoveries struggle to catch up.

To accomplish this, economic planners must move beyond the conventional liberalization and modernization strategy to a new strategy of development. This will take four strong attitudinal characteristics that nurture knowledge: determination, vision, openness and pragmatism. Effectively, this translates to going beyond freedom and modernity and becoming an innovator, a challenger, forward-looking, an opportunist, a global competitor and ultimately a ‘winner’ in the quest for knowledge and technology (World Bank, 2007a, p. 49).

One very promising new idea in accelerating the development of a knowledge economy in nations is that of establishing a knowledge bourse. A knowledge bourse would provide avenues for the participation of a large base of knowledge workers and experts at the local, regional and international levels in the process of building a knowledge society and thus facilitating the transition to a knowledge economy. The concept of trading in knowledge stocks and knowledge futures was conceived in Saudi Arabia and developed by pioneers who have been working for over a decade on R&D in different facets of knowledge investment. This financial innovation provides for systems and methods to establish a bourse specialized in trading in various forms of knowledge encompassing inventions, intellectual properties and any type of explicit knowledge that have tangible value in the marketplace. The creation of a knowledge bourse would provide a market for trading in knowledge stocks and commodities of different types. In Saudi Arabia, a road map was designed and drawn to implement a Saudi Knowledge Bourse both as part of the Saudi Exchange ‘Tadawul’ and as an independent entity specialized in knowledge trading (Tayeb et al., 2012; Tayeb and Al-Filali, 2011, 2012).

The knowledge economy carries great potential for nations who want to position themselves on the cutting edge of economic innovation and development, but the lion’s share of spoils will go to the nations of those planners perspicacious enough to embrace the need to be committed to and to be at the international forefront of implementation.

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Notes

1. Saudi Arabia’s decision makers are expected to be Comucipian in their outlook to the future of energy resources since they are affected by the Islamic tradition that assures that the wealth of every new born is predetermined by God.

2. In 2008, SABIC was Asia’s largest (in terms of market capitalization) and most profitable publicly listed non-oil company, the world’s fourth largest petrochemical company, ranked 186th on the Fortune Global 500 list of the largest corporations for 2009, the second largest producer of ethylene glycol and methanol in the world,
the third largest producer of polyethylene, and overall the fourth largest producer of polypropylene and polyolefin. Standard and Poor’s and Fitch Ratings identified SABIC as the world’s largest producer of polymers and the Arabian Gulf region’s largest steel producer for 2005 and assigned SABIC an ‘A’ corporate credit rating.

3. Studies suggest that the demand for expert thinking and complex communication is growing more rapidly than the demand for more conventional skills in the market for labour in industrial nations (World Bank, 2007, p. 12).

4. The literature is large and growing. For an excellent review of the literature and a fairly concise analysis of the prevalent debates regarding the knowledge economy, see Powell and Snellman (2004). For more recent and extensive analyses, see Dolgin (2012) and Ward (2012).

5. Even patents commonly expire after some designated period.

6. The World Bank’s (2012) Knowledge Economy Index (KEI) is a weighted average of the measures of all four of the pillars of a knowledge economy defined by the World Bank: education, innovation, ICT and economic incentive regimes.

7. Tadawul is the Saudi Arabia Stock Exchange.

8. Even the Council has progressed to a more publicly accountable institution with greater dialogue between it and government ministers (Ramady, 2010).

9. There have been a number of popular provocations on political issues reminiscent of the Arab Spring process (that is, networking and communication through modern media) that have got the attention of, and in some cases even responses from, the ruling family. To note a few, there was controversy over the floods in Jeddah in 2009, caused by government incompetence, which was amplified by video clips transmitted on the Internet.

10. The reforms are much more than just perfunctory window dressing. There has been much debate on the significance of the changes. Measured from a baseline of past political history, the reforms are significant. Measured by Western standards, they are considered relatively small still (The Long Day Closes 2012). But stable change can only occur incrementally, and there is no doubt that the trajectory of change is significant.

11. Gallarotti and Al-Filali (2012) have analyzed the role of soft power (that is, the cultivation of popular and elite support generated by perceptions of political legitimacy and cultural exceptionalism) in the history of the modern Kingdom.

12. Comparative studies of national economies during 1960–90 demonstrate that resource poor economies outperformed economies of resource-rich countries, including the Kingdom, by a factor of 2 to 3 times in terms of growth (Ramady 2005, p. 194).

13. An important institution for financing educational reform that has helped enhance the goal of Saudization by making training and education of Saudi citizens ‘fit the job’ is the Human Resources Development Fund, which was created in 2001 (Ramady, 2005).


16. Think tanks are in reality alien to the MENA region. Governments in MENA countries rely mostly on semi-permanent consultant groups in lieu of think tanks.

17. Currently, the National Renewable Energy Laboratory (NREL), Golden, Colorado.

18. We also see the creation and growth of women’s organizations in the Kingdom. Such organizations are a boon, creating support networks that empower women.

19. The World Bank (2007a, pp. 15–18) report on Building Knowledge Economies stresses the burgeoning competition among nations to transition toward knowledge economies, and that the competition is especially fierce among developing nations that are using knowledge capital as the basis of their development strategies.

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