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The Arab Gulf States and the Knowledge Economy: Challenges and Opportunities

Mahfouz E. Tadros

Policy Paper

#6

2015

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Arab Gulf States Institute in Washington
1050 Connecticut Avenue, NW
STE 1060
Washington, DC 20036

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About the Author

Mahfouz E. Tadros, PhD is a former World Bank staff member with 30 years experience in economic development in various parts of the world, including South Asia, East Asia, Sub-Saharan Africa, and the Middle East and North Africa. Tadros served as the resident representative of the World Bank in Sudan and as a senior advisor to the team that established the Global Coalition for Africa. He was the manager of the World Bank's Technical Cooperation Program for the GCC states. Following retirement from the World Bank, Tadros spent 10 years in Kuwait as senior advisor to the director general of the Kuwait Institute for Scientific Research, and as a part-time senior advisor to three ministers of finance. He was a member of the panel that reviewed the Strategic Plan for the Kuwait Foundation for the Advancement of Science.

July 14, 2015

The Arab Gulf States and the Knowledge Economy: Challenges and Opportunities

By Mahfouz E. Tadros

Executive Summary

As the countries of the Gulf Cooperation Council (GCC) strive to compete in the 21st century, they face a number of challenges, including fluctuating oil and gas prices, economic diversification, and the need to build up human capital and create jobs for GCC nationals. To address these challenges, the Arab Gulf states are embarking on knowledge-based economic development.

To improve human capital, GCC states have made generous investments in financing education at all levels, telecommunication infrastructure and services, and Science, Technology, and Innovation (STI). There is room, however, to maximize benefits from these investments, and there are many opportunities for GCC states to benefit from knowledge-based economic development. A business-friendly environment, including transparent regulations, financing mechanisms, and venture capital, is required to create jobs for GCC nationals and to encourage young entrepreneurs and innovators to commercialize proven research output and innovative ideas.

This paper will highlight and review knowledge-based economy, the information society, innovation ecosystem, and key STI indicators for selected countries, including the GCC states, and compare them with the BRICS group of countries: Brazil, Russia (Russian Federation), India, China, and South Africa. Additionally, it will analyze a comparison of performance of GCC and BRICS countries in terms of The Networked Readiness Index 2015, The Global Innovation Index 2014, Key STI Indicators, and the "Doing Business 2015: Going Beyond Efficiency." Finally, the paper will review GCC states' recent actions and achievements toward knowledge-based development and outline future challenges and opportunities.

Policy Recommendations: Arab Gulf States

- To compete in the 21st century, the GCC states should articulate their STI vision and implement strategies and programs to propel their countries toward diversified and sustained knowledge and innovation-based development.

- The GCC states should maximize their benefits from the large investments they have made in education at all levels, and in ICT and STI, including Research and Development (R&D). This can best be accomplished by creating an enabling environment to invest in knowledge-related sectors. This will require a new emphasis on developing competitive, transparent, productive, and sustainable economies.

- The GCC states should focus the commercialization of research outcomes on areas of strategic importance to them and on providing products, services, and processes, not only to the GCC domestic markets but also to the larger markets of the region and beyond.

- GCC states should coordinate their STI activities and establish Regional Centers of Excellence for issues of strategic importance such as water desalination, environmental issues, and renewable energy. This will avoid duplication of efforts and enhance regional integration.

- GCC states such as Kuwait, Qatar, and the United Arab Emirates that have set targets to increase R&D expenditures as a percentage of gross domestic product (GDP) should make concerted efforts to meet these targets. Other countries should be encouraged to set and meet realistic targets.

- GCC states should encourage the private sector to invest more in training and capacity building as well as R&D and innovation. There should additionally be more collaboration between universities and research centers and the private sector.

- GCC states should make it easier to do business in their countries, so as to encourage private sector investments, including Foreign Direct Investment (FDI). This will result in technology transfers and spillover effects, leading to knowledge and innovation-based economies.

- GCC states should ensure the availability of adequate early-stage funds including seed, angel, venture capital, and crowd financing to encourage entrepreneurs and innovators to scale up and commercialize their research outcomes and innovative ideas.

- GCC states should further encourage GCC research centers and universities to carry out collaborative research with leading research institutions and universities in Organization for Economic Cooperation and Development (OECD) countries.

Policy Recommendations: United States

- The United States should further encourage and support GCC nationals to study in the United States, particularly in Science, Technology, Engineering, and Mathematics (STEM), including facilitating student visas.

- The United States should increase collaborative research and the exchange of scientists, researchers, and professors between U.S. universities and research centers and GCC research institutions. American professors, scientists, and researchers should be encouraged to spend part of their sabbaticals in GCC universities and research centers, and vice versa. Such cooperation has already begun through the establishment of branches of U.S. universities in GCC states, such as the American University in Kuwait, New York University in Abu Dhabi (NYUAD) and Cornell Medical School, Texas A&M, Georgetown University, and Carnegie Mellon in Qatar.

- The United States should further encourage and intensify collaboration between U.S. National Laboratories and GCC states, as it does through the Sandia international programs. The Gulf Nuclear Energy Infrastructure Institute (GNEII) that recently opened in Abu Dhabi is a good example of such collaboration.

- The U.S. private sector should support GCC states by transferring relevant technologies and by building up the skills and competencies of GCC nationals in order to increase the human capital of GCC nationals.

- The United States and GCC states should encourage GCC scientists and researchers to register and patent their proven research outcomes and innovative ideas in the United States Patent and Trademark Office (USTPO).

- The United States should increase interaction between the U.S. Small Business Administration and GCC institutions, so as to benefit from lessons learned and best practices.

Introduction

The emergence of Information Communication Technology (ICT), biotechnology, nanotechnology, and other high technologies provides great opportunities for small and large countries to increase their competitive advantage through knowledge-based economies. Many countries are engaging upon knowledge-based development and achieving high rates of economic growth by building up their human capital, national Science, Technology, and Innovation (STI) capacity, and implementing STI strategies. Governments now realize that knowledge and innovation are the main drivers of job creation, export promotion, and economic growth. In 2008, Korea established a Ministry for Knowledge Economy and other countries have articulated explicit knowledge-based development strategies and policies including Brazil, Finland, Ireland, Malaysia, and South Africa.

The importance STI as the main resource and the driving force of knowledge economies is well known, and to compete in the 21st century the Arab Gulf states are articulating new visions and implementing strategies and programs to propel their countries toward diversified and sustained knowledge-based economies. Some Arab Gulf states have created an enabling environment to encourage entrepreneurs to commercialize proven technologies and innovative ideas, but others are still in the initial stages of developing knowledge-based economies.

Knowledge-Based Economy

The World Bank,[1] the Organization for Economic Cooperation and Development (OECD),[2] and the European Union (EU)[3] have developed various frameworks and methodologies for assessing the development of knowledge-based economies. The main drivers for a knowledge-based economy include investments in: all levels of education; research and development (R&D), including capacity building and collaborative research; entrepreneurship; access to finance, including seed, angel, and venture capital; science parks and business incubators; and commercialization of proven technologies. These investments will not yield the desired results unless there exists a sound macroeconomic framework, an effective innovation ecosystem, and a business friendly environment, including transparent regulations. These are important factors to encourage private sector investments, including Foreign Direct Investment (FDI), resulting in technology transfers, spillover effects, and leading to knowledge-based development.

Nevertheless, creating new products, services, and processes will only be beneficial if there is adequate demand. Therefore R&D activities must cater to the needs of the market (local, regional, and international), and GCC states should focus their R&D activities on areas of strategic importance to their countries and the region.

1 "Measuring Knowledge in the World's Economies," ***World Bank Institute, Knowledge for Development Program***, 2007. http://siteresources.worldbank.org/INTUNIKAM/Resources/KAM_v4.pdf.

2 OECD Science, Technology and Industry Scoreboard 2005," ***OECD***, 2005 http://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-industry-scoreboard-2005_sti_scoreboard-2005-en.

3 "Innovation Union Scoreboard: The Innovation Union's performance scoreboard for Research and Innovation," ***European Commission***, 2010. https://ec.europa.eu/research/innovation-union/pdf/iu-scoreboard-2010_en.pdf.

Furthermore, financing R&D, building state-of-the-art science parks, and giving industry tax breaks are not sufficient to commercialize and innovate. Researchers and entrepreneurs operate according to different cultures and institutional logics. Knowledge-based development requires a holistic approach that brings together researchers, entrepreneurs, and policymakers. Connecting scientist and researchers with entrepreneurs in clusters, networks, and regions is an essential ingredient for an innovation ecosystem. Many models and initiatives in the United States have led to economic growth, diversification, and employment creation, such as the Research Triangle Institute (RTI) in North Carolina, the San Diego Wireless Communication Cluster, the Stanford Technology Venture Program, and the Massachusetts Institute of Technology's (MIT) Deshpande Center and university. MIT is the driving force behind the Route 128 region around Boston and the Cambridge Biotech Cluster. Stanford is the driving force behind Silicon Valley. There are other models in other countries: the Kyoto University model of university-industry collaboration in Japan; Dubai Internet City, Dubai Technology Park and Dubai Silicon Oasis, and Khalifa University for Science, Technology and Research and Masdar Institute in collaboration with MIT in the United Arab Emirates; the knowledge and innovation cities, and King Abdullah City for Science and Technology (KACST), including eight technology incubators in Saudi Arabia; and Qatar Education City and Qatar Science and Technology Park.

Knowledge-based development requires strong R&D institutions, an industrial base, a pool of skills and competences, a strong physical and cyber infrastructure, and a business-friendly regulatory framework. An Innovation Ecosystem requires removing barriers between organizations and individuals, as well as increasing collaboration across disciplines and sectors. It also requires a culture that supports taking risks, tolerating failures, learning from failed experiences and best practices, and celebrating success.[4]

Knowledge-based development requires strong R&D institutions, an industrial base, a pool of skills and competences, a strong physical and cyber infrastructure, and a business-friendly regulatory framework.

Various studies have been carried out to highlight the importance of knowledge-based development in the Arab World, including the Arab Gulf states. The Director General of the Islamic Educational, Scientific and Cultural Organization (ISESCO) Abdulaziz Othman Altwaijri noted that, "The implementation of a knowledge and innovation-based development strategy requires a vision, strong coordination at the top level of government, and a participatory approach to mobilize the population to back the needed reforms."[5] GCC states commissioned and carried out country specific studies on knowledge and innovation-based development, such as "Kuwait and the Knowledge Economy."[6]

The Information Society

The World Bank's World Development Indicators (WDI) 2015 include various measures of performance for an "information society." GCC states fare well on some of these indicators,

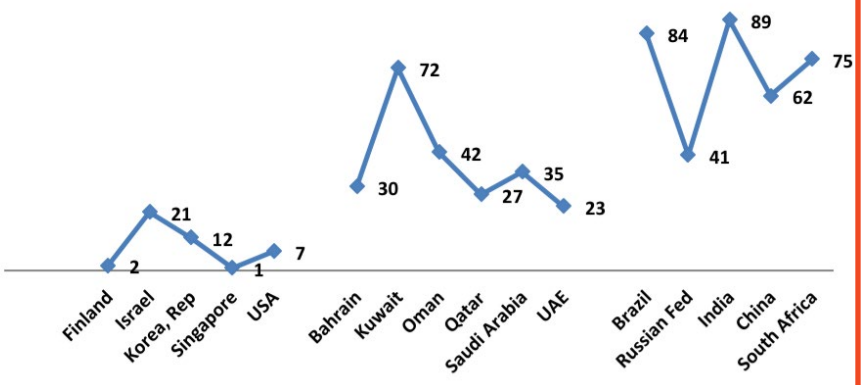
4 Adriene J. Burke, "How to Build an Innovation Ecosystem," ***The New York Academy of Science***, April 21, 2011. http://www.nyas.org/publications/Detail.aspx?cid=da1b8e1d-ed2d-4da4-826d-00c987f63c82.

5 "Transforming Arab Economies: Travelling the Knowledge and Innovation Road," ***World Bank***, 2013.

6 Ian Brinkley, Will Hutton, Philippe Schneider, and Kristian Coates Ulrichsen, "Kuwait and the Knowledge Economy," ***The Work Foundation and the Kuwait Programme on Development Governance and Globalisation in the Gulf States***, April 2012. http://www.theworkfoundation.com/DownloadPublication/Report/309_Kuwait-and-the-knowledge-economy.pdf.

particularly the percentage of population using the Internet. Further insight into the technological capacity of GCC states can also be gained from the Global Information Technology Report 2015, which covers 143 countries and includes the Networked Readiness Index 2015 rankings. This index "assesses the factors, policies and institutions that enable a country to fully leverage information and communication technologies (ICTs) for increased competitiveness and well-being."[7]

Chart 1 - Networked Readiness Index Rank, 2015



Cornell University, WEF, and INSEAD – The Global Information Technology Report 2015.

Chart 1 shows that Singapore ranked number one for networked readiness, followed by Finland, Sweden, the Netherlands, Norway, Switzerland, the United States, the United Kingdom, Luxembourg, and Japan. The Arab Gulf states feature prominently in this index, thanks to the generous investments they have made in ICT. Three GCC states ranked in the top 30 countries in this index: UAE (23), Qatar (27), and Bahrain (30). Except for Kuwait, other GCC states ranked better than the BRICS countries, though the Russian Federation (41) ranked above Saudi Arabia (42). GCC states should build on their success in ICT to ensure the participation of a larger segment of their population in the information society. ICT, however, is not sufficient; this has to be complemented by a dynamic and efficient innovation ecosystem.

The Innovation Ecosystem

As noted, the innovation ecosystem is a dynamic and interdependent process whereby researchers and entrepreneurs collaborate and interact to promote commercial experimentation with different ideas and technologies. In this regard, innovation is an economic act. Cornell University, the international business school INSEAD, and the World Intellectual Property Organization (WIPO) have developed a Global Innovation Index (GII). The theme of the GII 2014, which covers 143 countries, is "The Human Factor in Innovation."[8] Chart 2 shows GII 2014 for selected countries including GCC and BRICS countries.

The top 10 economies in GII 2014 are Switzerland, the United Kingdom, Sweden, Finland, the Netherlands, the United States, Singapore, Denmark, Luxembourg, and Hong Kong (China).[9] Three GCC states ranked in the top 50: the UAE (36), Saudi Arabia (38), and Qatar (47). Chapter

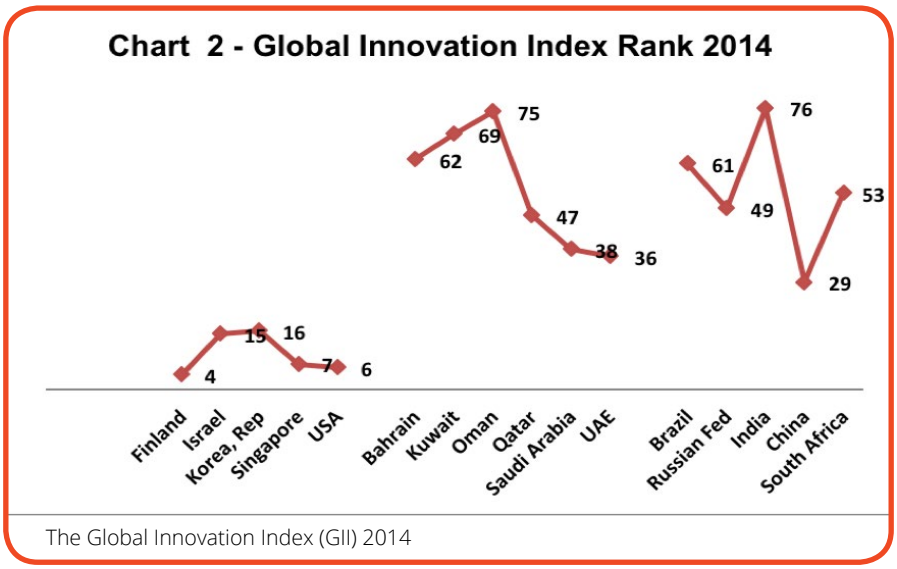
7 Ed. Soumitra Dutta, Thierry Geiger, Bruno Lanvin, "The Global Information Technology Report 2015" ***World Economic Forum***, 2015. http://www3.weforum.org/docs/WEF_Global_IT_Report_2015.pdf.

8 Ed. Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent, "The Global Innovation Index 2014: The Human Factor in Innovation," ***The Global Innovation Index***, 2014. https://www.globalinnovationindex.org/content.aspx?page=gii-full-report-2014.

9 Ibid.

six of the GII 2014 reviews the Innovation Ecosystem in the UAE,[10] and provides insights into why the UAE ranks as prominent in this index.

Only two BRICS countries, China (29) and the Russian Federation (49), join the top 50 rank (Chart 2). As the authors of the index note: Regional trends in the GII 2014 show signs of divergence, "with China improving at a significantly faster pace than its BRICS counterparts and India slipping back."[11]



The Global Innovation Index (GII) 2014

Key STI Indicators

Various indictors are used to monitor and measure STI. These indicators include: R&D Expenditures as Percentage of GDP; Number of Researchers in R&D per Million People, R&D Expenditures per Researcher; High-Technology Exports as Percentage of Manufactured Exports; Number of Scientific and Technical Journal Articles; and Number of Patent Applications Filed by Residents and Non-Residents. In addition to these indicators, the Science Citation Index (SCI) is commonly used to measure scientific output.

The following section will focus on reviewing and analyzing two key STI indicators: R&D Expenditures as Percentage of GDP and High-Technology Exports as Percentage of Manufacturing Exports for selected countries, including GCC and BRICS countries.

R&D Expenditures as Percentage of GDP

"Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development."[12] While this is an important indicator, the composition of these expenditures should be analyzed. In some countries R&D expenditures include a very large portion (about 85 to 90 percent) for salaries of researchers and technicians, which leaves very little funding for research equipment, material, training, and capacity building. While higher spending on R&D is important, increasing expenditures on knowledge-based intangibles such as ICT skills and competencies are essential to prepare "knowledge workers" to support knowledge-based development.

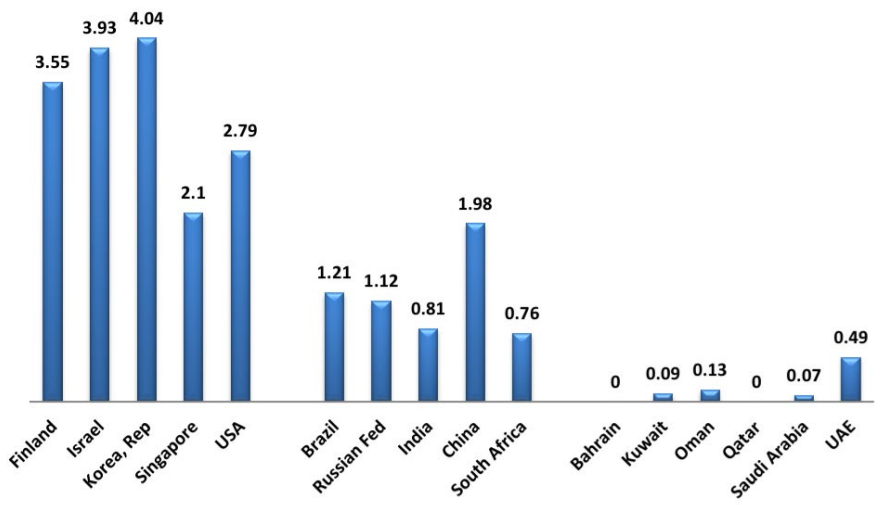
11 Ed. Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent, "The Global Innovation Index 2014: The Human Factor in Innovation," ***The Global Innovation Index***, 2014. https://www.globalinnovationindex.org/content.aspx?page=gii-full-report-2014.

12 "World Development Indicators 2015," ***World Bank***, April 25, 2015. http://data.worldbank.org/data-catalog/world-development-indicators.

The main sources of financing R&D are public or government funding of national research institutions and research projects in universities and the private sector, including large corporations and Small and Medium Enterprises (SMEs) that carry out their own research or finance specific R&D projects in public research institutions and universities. The ratio of public and private financing of R&D varies from country to country. In the United States, for example, the private sector currently provides about 70 percent of R&D expenditures, while the European Council has set a target for the private sector to finance about 66 percent of R&D by 2020. Many countries provide tax breaks for the private sector to induce it to increase its investments in R&D. Nevertheless, the share of private sector financing for R&D in the Arab world is very low – about 3 percent – while the public sector financed 89 percent of R&D and other sources funded 8 percent.[13]

The world average of R&D expenditures as percentage of GDP was 2.13 percent in 2011. Chart 3 reveals that Korea has the highest R&D expenditures as percentage of GDP at 4.04 percent. In 2012 Korea recorded the highest score of 4.04 percent, followed by Israel at 3.93 percent, Finland at 3.55 percent, and Japan at 3.39 percent. To emphasize the importance of STI, in 2008 Korea established a Ministry for Knowledge Economy. The United States is planning to increase R&D expenditures as percentage of GDP from the current level of 2.79 to 3.0 percent by 2020.[14]

Chart 3 - R&D Expenditures as % of GDP



World Bank – World Development Indicators (WDI) 2015. Most of the above data are for 2012. Most Recent Value (MRV) is used if data for the specified year or full period are not available.

In 2012 China scored the highest at 1.98 percent among the BRICS countries and India scored the lowest at 0.76 percent. Realizing the value of STI, China has more than doubled its R&D expenditures from 0.9 percent in 2000 to 1.98 percent in 2012. Among global regions, the euro area had the highest score at 2.14 percent in 2012 and Sub-Saharan Africa the lowest at 0.58 percent. No data was available for the Middle East North Africa (MENA) region. However, discreet data is available for some of the MENA countries, including GCC states.[15]

13 Ed. Kristin Helmore, and Zahir Jamal, "The Arab Human Development Report 2003: Building a Knowledge Society," *United Nations Arab Human Development Reports*, 2003. http://www.arab-hdr.org/publications/other/ahdr/ahdr2003e.pdf.

14 "Science and Engineering Indicators: 2010," *National Science Foundation*, 2010. http://www.nsf.gov/statistics/seind10/.

15 "World Development Indicators 2015," *World Bank*, April 25, 2015. http://data.worldbank.org/data-catalog/world-development-indicators.

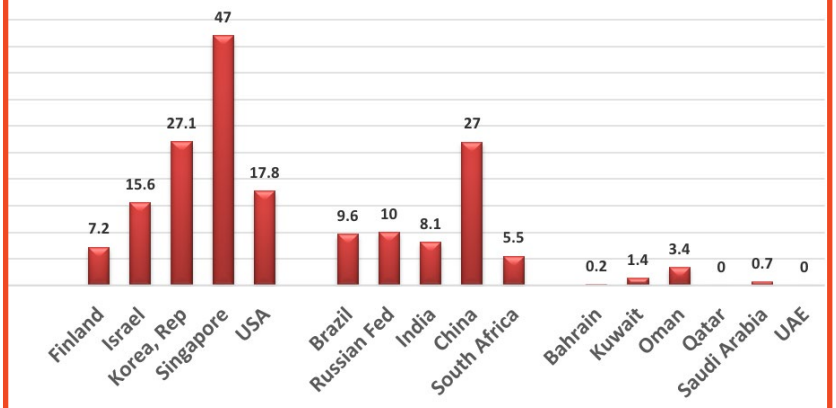
Chart 3 shows that among the GCC states, the UAE has the highest ratio of R&D expenditures as percentage of GDP at 0.49 percent, followed by Oman at 0.13 percent, Kuwait at 0.09 percent, and Saudi Arabia at 0.07 percent. No data was available in the WDI 2015 for Bahrain and Qatar. However, data from other sources show that Qatar R&D expenditures as percentage of GDP is targeted to be 2.8 percent.[16]

Recognizing the importance of R&D some of the Arab Gulf states have set up targets to increase their expenditures on R&D as percentage of GDP. Kuwait's Four Year Development plan (2010-11 to 2013-14)[17] proposed to increase to 1 percent R&D expenditures as percentage of GDP. The UAE Vision 2021[18] aims at increasing R&D expenditures as percentage of GDP to 1.5 percent. The president of R&D at The Qatar Foundation indicated that Qatar aims to increase its R&D expenditures as a percentage of GDP to reach the 2.8 percent target.[19] GCC states should invest more in R&D by meeting existing targets and setting up realistic targets to increase expenditures of R&D as percentage of GDP.

High-Technology Exports as Percentage of Manufactured Exports

"High-technology exports are products with high R&D intensity, such as aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery."[20] The higher the ratio of high-technology exports to manufacturing exports the more likely it is that a country is moving toward a diversified and knowledge based-economy. In his State of the Union address in 2012, President Barack Obama envisioned the United States as "An America that attracts a new generation of high-tech manufacturing and high-paying jobs." This underscores the importance of high-technologies in the 21st century.

Chart 4 - High-Technology Exports as % of Manufacturing Exports



World Bank – World Development Indicators (WDI) 2015. Above data are for 2013.

In 2013 the world average for high-technology exports as percentage of GDP was 17.8 percent, which is identical to the U.S. score. Chart 4 shows that Singapore recorded the highest score at

16 Martin Grueber, and Tim Studt, "2014 Global R&D Funding Forecast," ***Batelle***, 2013. http://www.battelle.org/docs/tpp/2014_global_rd_funding_forecast.pdf.

17 Ashwin Matabadal, "Country Report Kuwait: Four Year Development Plan," ***Rabobank***, 2013. https://economics.rabobank.com/publications/2013/august/country-report-kuwait/.

18 "UAE Vision 2021: Competitive Knowledge Economy" ***Vision 2021***, 2012. http://www.vision2021.ae/en/national-priority-areas/competitive-knowledge-economy.

19 "Mohammad Yahia, "Qatar's Peculiar Research Funding Dilemma," ***House of Wisdom, Nature Middle East***, November 28, 2013. http://blogs.nature.com/houseofwisdom/2013/11/qatars-peculiar-research-funding-dilemma.html.

20 "World Development Indicators 2015," ***World Bank***, April 25, 2015. http://data.worldbank.org/data-catalog/world-development-indicators.

47.0 percent in 2013, followed by Korea at 27.1 percent and China at 27.0 percent. This implies that these countries have more diversified knowledge and innovation-based economies. China also recorded the highest score at 27.0 percent among the BRICS countries in 2013. The scores of these three countries also explain why the East Asia and Pacific region has the highest regional score at 26.8 percent.[21]

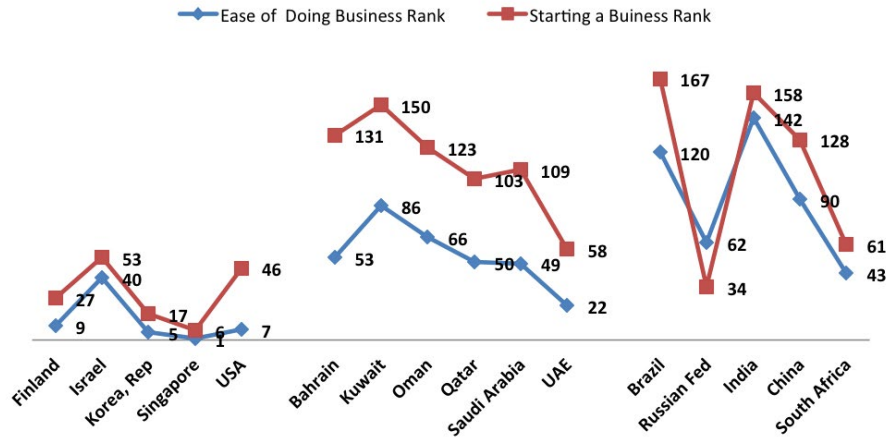
Among the GCC states, Oman scored the highest at 3.4 percent, followed by Kuwait at 1.4 percent, Saudi Arabia at 0.7 percent, and Bahrain at 0.2 percent in 2013 (Chart 4). No data was available in the WDI 2015 for Qatar and the UAE. The MENA region had the lowest score of 2.0 in 2013; the second lowest score of 4.3 percent was recorded by Sub-Saharan Africa. MENA countries, including GCC states, should make concerted efforts to increase their high-technology products and exports so that their economies become more diversified and knowledge-based.

Business Enabling Environment

As indicated, a business-friendly environment and transparent regulations are necessary drivers for commercialization of technologies, leading to innovation-based development. It is important for policymakers to know where their economy stands in the aggregate ranking on ease of doing business. It is also useful to know how a country ranks compared with other countries. The World Bank and International Finance Corporation report "Doing Business 2015: Going Beyond Efficiency" ranked 189 countries in terms of ease of doing business. Singapore ranked first[22] and was followed by New Zealand, Hong Kong (China), Denmark, Korea, Norway, the United States, the United Kingdom, Finland, and Australia.

Doing Business measures regulations affecting key areas of the life cycle of a business. The Doing Business 2015 rankings include: starting a business; dealing with construction permits; getting electricity; registering property; getting credit; protecting minority investors; paying taxes; trading across borders; enforcing contracts; and resolving insolvency.[23]

Chart 5 - Ease of Doing Business and Starting a Business Ranks



World Bank/IFC – "Doing Business 2015: Going Beyond Efficiency" 2014

21 "World Development Indicators 2015," ***World Bank***, April 25, 2015. http://data.worldbank.org/data-catalog/world-development-indicators.

22 A high ranking on the Ease of Doing Business Index means the regulatory environment is more conducive to the starting and operation of a local firm.

23 "Doing Business 2015: Going Beyond Efficiency," ***World Bank***, 2014. http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB15-Full-Report.pdf.

Chart 5, above, shows the rankings of a selected group of countries, including GCC and BRICS countries, in terms of ease of doing business and starting a business.

Three GCC states were ranked in the top 50 countries in ease of doing business: the UAE (22), Saudi Arabia (49), and Qatar (50). Whereas, rankings of the other GCC states were: Bahrain (53), Oman (66), and Kuwait (86). The UAE also has the highest rank among the GCC states at 58 in terms of starting a business. The other five GCC states were ranked above 100 (Chart 5). This suggests that these countries should make concerted efforts to improve their rankings in future years.

Of the BRICS countries, only South Africa ranked in the top 50 in ease of doing business at 43. Among the BRICS countries, in terms of starting a business, the Russian Federation ranked in the top 50 at 34, followed by South Africa at 61. The other BRICS countries ranked above 100 (Chart 5). The rank of each country changes from year to year based on the reforms each country makes in a given year.

Conclusion

To compete in the 21st century, and to diversify their economies and create skilled jobs for their nationals, the Arab Gulf states are building up human capital and moving toward knowledge-based economic development. Some GCC states have articulated their visions on knowledge and innovation-based economy; others are implementing policies and programs to propel their economies toward that goal. The vision statements and development plans of the Arab Gulf states make specific references to knowledge and innovation-based economic development.

The Arab Gulf states are at various stages of diversifying their economies, with the UAE considered the most diversified economy among the GCC states. These diversification efforts, however, have not remedied the region's labor market and human capital distortions.[24] Some of the challenges and opportunities facing the GCC states include:

- Reforming the education sector and ensuring that education outputs cater for the skills and competencies required by the market. The education system should be geared toward producing "knowledge workers."
- Providing the enabling environment for scientists, entrepreneurs, and innovators to scale up their proven research output and innovative ideas by creating clusters.
- Ensuring the availability of finance, including seed, angel, venture capital, and crowd financing to encourage entrepreneurs and investors to commercialize their products, processes, and services.
- Increasing interaction between research centers/universities and industries.
- Increasing the role of the GCC states as "producers" and not only "consumers" of knowledge.

24 Michael C. Ewers, "Oil, human capital and diversification: the challenging of transition in the UAE and the Arab Gulf states," ***The Geographical Journal***, February 11, 2015.

- Building on the success of ICT to ensure the participation of larger segments of the population in the information society.
- Investing more in R&D by meeting existing targets and setting up realistic targets to increase expenditures of R&D as percentage of GDP.
- Increasing high-technology exports as percentage of total manufacturing exports.
- Targeting regional markets for knowledge products, services, and processes.
- Encouraging and providing incentives to the private sector to invest more in R&D and build the human capital of GCC nationals.
- Increasing the benefits from FDI by ensuring the transfer of technology and skills to local markets and GCC nationals.
- Improving the rankings of GCC countries in the various indices, including the Networked Readiness Index, the Global Innovation Index, the Global Competitiveness Index, and the Doing Business rankings.

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