



Invited Paper - American Influence on Engineering Education in the Middle East

Dr. Russel C. Jones, World Expertise LLC

Russel Jones is a consultant, working through World Expertise LLC. Until recently he was senior Advisor at the Khalifa University of Science, Technology and Research, a new institution in Abu Dhabi, UAE. KUSTAR offers undergraduate and graduate programs in engineering and science. Prior to that, he served as Founding President of the Masdar Institute of Science and Technology in Abu Dhabi, UAE – a new university dedicated to graduate education and research, focused on alternative energy. He serves as President of World Expertise LLC, a consulting company offering services to a select clientele. His primary interests are international higher education and human capacity building through engineering education. Dr. Jones received his education at Carnegie Institute of Technology, earning degrees in civil engineering and materials science. Prior to returning to Carnegie for his doctoral study, he worked as a practicing civil engineer. He has spent much of his career as an educator, starting with engineering education and broadening to higher education as a whole. After completing his doctoral degree in 1963, he taught for eight years on the faculty of the Massachusetts Institute of Technology. He then served in a succession of administrative posts in higher education, for several years each: Chairman of Civil Engineering at Ohio State University, Dean of Engineering at the University of Massachusetts, Academic Vice President at Boston University, and President and University Research Professor at the University of Delaware. Prior to forming World Expertise L.L.C. as president, he served as Executive Director of the National Society of Professional Engineers, an individual member society for the licensed professional engineer with offices in Alexandria, Virginia. Long active in the engineering profession, Dr. Jones has served as a national officer of the American Society of Civil Engineers, has chaired major task committees for such groups as the American Society for Engineering Education and the American Association of Engineering Societies, and has served as President of the Accreditation Board for Engineering and Technology. He was General Chairman for UPADI '90, the biannual meeting of the Pan American Association of Engineering Societies, and has served as Co-chair of the UNESCO Steering Committee on Human Resources Development for Technical Industry Stimulation. Prior to becoming its Executive Director, Dr. Jones was active as a volunteer in the National Society of Professional Engineers, and served as President of its Delaware Engineering Society. He has been an elected member of the Council of the Delaware Association of Professional Engineers, the state PE registration board. He is licensed as a Professional Engineer in several states, and as a Euro Engineer with FEANI. Dr. Jones has been honored with the Collingwood Prize and the Friedman Professional Recognition Award of the American Society of Civil Engineers, and was elected to Distinguished Member status in ASCE in 2004. He has been awarded the International Medal for Distinguished Contributions to Engineering Education of the Australasian Association for Engineering Education, and has been honored as the Outstanding Delaware Engineer of the Year for 1994. Dr. Jones has been honored as the recipient of the 2005 Chair's Award of the American Association of Engineering Societies. In 2012, Dr. Jones was recognized with a distinguished alumni award from his alma mater, Carnegie Mellon University. He is a Fellow of the American Society for Engineering Education, the American Association for the Advancement of Science, the Institution of Engineers of Ireland, the Accreditation Board for Engineering and Technology, the National Society of Professional Engineers, and the Royal Society for the Encouragement of Arts, Manufacture and Commerce. He was a Senior Fellow of the American Council on Education in 1988-90. Recently, Dr. Jones has been most active in consulting on the enhancement of engineering education in developing countries, and in chairing volunteer activities in that area. He was President of the World Federation of Engineering Organizations Committee on Capacity Building, establishing programs to build technical capacity in developing countries in order to stimulate economic development there. He also has recently served as Chair of the International Division of the American Society for Engineering Education, and as President of the Committee on Engineering Education of the Pan American Association of Engineering Societies. Dr. Jones also recently served as a member of the United States National Commission on UNESCO, providing guidance to the US State Department and to its Ambassador to UNESCO.

TRANSFORMING MIDDLE EAST ECONOMIES THROUGH EDUCATION, RESEARCH AND INNOVATION

Introduction

Several countries in the Middle East with oil-based economies, such as the United Arab Emirates, the Kingdom of Saudi Arabia, and Qatar have come to understand that they must diversify their economies, utilizing significant amounts of the income from sale of their oil and gas at current prices to invest in future commercial efforts. These countries have come to recognize that their substantial incomes from the sale of oil and gas will have a finite lifetime, and that they should be investing some of today's income flow in economic diversification. The world wants to use less oil – both due to its cost, and due to the pollution of the environment which is leading to global warming. In addition, the oil supply in producing countries will run out someday, in many cases in less than 100 years.

In particular, several such countries are focusing on diversifying to “knowledge-based economies”, by developing higher education programs that will provide the human capacity to initiate and support such new economic thrusts. Total spending by the Gulf Cooperation Council countries on education in 2008 exceeds their \$20-billion in arms purchases from the United States.

This paper describes education initiatives in the Persian Gulf region aimed at transforming national economies through education, research and innovation. It also reviews the efforts of several US engineering schools which have entered into partnerships with governments, or opened some version of a branch campus, to offer engineering education programs in the Middle East.

Education initiatives in the Persian Gulf region

Several US engineering schools have entered into partnerships with governments, or opened some version of a branch campus, to offer engineering education programs in the Middle East.

Qatar

In Qatar, the Qatar Foundation has established a major Education City in Doha which hosts branch campus programs of six major US universities. The Qatar Foundation was established in 1995 by the country's ruler, with a multibillion-dollar endowment to fully finance universities that agreed to open branches there. Programs range from a medical school supported by Cornell University to a foreign service school offered by

Georgetown University, with other programs by Virginia Commonwealth University and Northwestern University. Engineering programs are offered by Texas A&M University and Carnegie Mellon University. Purpose built state-of-the-art learning and teaching facilities have been built for each university.

Texas A&M University at Qatar offers undergraduate degrees in chemical, electrical, mechanical and petroleum engineering. It graduated two students in 2007 and a full class in 2008. It is beginning to offer two graduate programs, a Master of Engineering Degree and a Master of Science Degree. The undergraduate curriculum integrates cutting-edge and applied research with innovative classroom instruction to ensure that its graduates are equipped to assume leadership roles after graduation.

Carnegie Mellon Qatar has offered undergraduate programs in Computer Science and Business Administration since 2004. It has recently added a new Information Systems degree. These programs are aimed at providing the human capital to develop an effective Information and Computer Technology (ICT) structure, one of the main pillars of the knowledge-based society that Qatar aspires to become.

Saudi Arabia

King Abdullah University of Science and Technology (KAUST) is being built in Saudi Arabia as an international, graduate level research university dedicated to stimulating a new age of scientific achievement in the Kingdom. The University is scheduled to open in September 2009 with degrees in 11 fields of study:

- Applied Mathematics and Computational Science
- Bioscience
- Chemical and Biological Engineering
- Chemical Science
- Computer Science
- Earth Science and Engineering
- Electrical Engineering
- Environmental Science and Engineering
- Marine Science and Engineering
- Materials Science and Engineering
- Mechanical Engineering

Its international academic partnerships, designed to help build the curriculum and attract strong founding faculty, include two US institutions, Woods Hole Oceanographic Institution and the University of California at San Diego. Its global research partners who will join in collaborative research working on topics of global significance, include Cornell University, Stanford University, Texas A&M University and faculty members from Massachusetts Institute of Technology, California Institute of Technology, Michigan State University, Georgia Institute of Technology, Pennsylvania State University, and the University of California at Berkeley.

KAUST is well funded, with a multi-billion dollar endowment. It will enroll both men and women from around the world. The campus, located on the Red Sea at Thuwal, north of Jeddah, is being built in 36 million square meters of land.

United Arab Emirates - Dubai

Dubai Academic City presents a different model for international academic programs.⁶ Launched in May 2006, it contains “store front” operations of some 32 universities currently. It is a “free zone”, meaning that institutions housed there are not required to seek UAE accreditation. It currently serves some 12,000 students on an integrated 25-million square foot campus. It is intended to complement an earlier Knowledge Village, launched in 2003, which focuses on training institutes and educational service organizations. Knowledge Village is set up as a profit-making enterprise, where the government-owned company that runs the complex earns money by leasing the buildings to foreign universities.⁵

Michigan State University Dubai offers bachelor’s degree programs including Computer Engineering and Construction Project Management. It is adding postgraduate degree programs, including a Master of Science in Supply Chain Management. The decision to open operations in Dubai was contingent on several conditions: a requirement that the project be self-sustaining, not use taxpayer money, not drain resources from the main campus, and not utilize foreign investors to underwrite the campus.

Rochester Institute of Technology Dubai is offering master’s degree programs including Electrical Engineering, Mechanical Engineering, and Networking and Systems Administration. These are currently offered as part-time study programs in evenings and on weekends. Undergraduate programs in engineering are expected to be offered starting in 2010.

United Arab Emirates – Abu Dhabi

The Petroleum Institute was created in 2001 to provide engineering education and research in areas of significance to the oil and gas and broader energy industries⁸. It was initiated with major assistance from the Colorado School of Mines, and more recently has also affiliated with the University of Maryland. It offers bachelor’s degrees in Chemical, Electrical, Mechanical, Petroleum and Petroleum Geosciences Engineering, and Master of Engineering Degrees in Chemical, Electrical, Mechanical and Petroleum Engineering. It currently has over 1000 undergraduate students and some 50 graduate students.

The New York Institute of Technology⁹ has been offering degree programs in Abu Dhabi since 2005. Its bachelor’s degree programs include Computer Science and Information Technology, and its master’s degree programs include Computer Science, Electrical and Computer Engineering, and Information, Network and Computer Security. Its classes are coeducational, and follow the same curriculum as its New York campuses.

Enrollment is currently 350, taught by 20 full-time faculty members supplemented by visiting NYIT faculty from New York.

New York University/Abu Dhabi is being established as a comprehensive liberal arts and sciences campus in Abu Dhabi. With the recent merger of NYU and the Polytechnic University, it is anticipated that engineering programs will eventually be offered at NYU/Abu Dhabi.

Abu Dhabi

The rulers of Abu Dhabi Emirate, largest of the seven bodies that comprise the United Arab Emirates, have established an aggressive plan for diversification of the currently heavily oil-based economy. The vision for Abu Dhabi, currently being implemented, included:

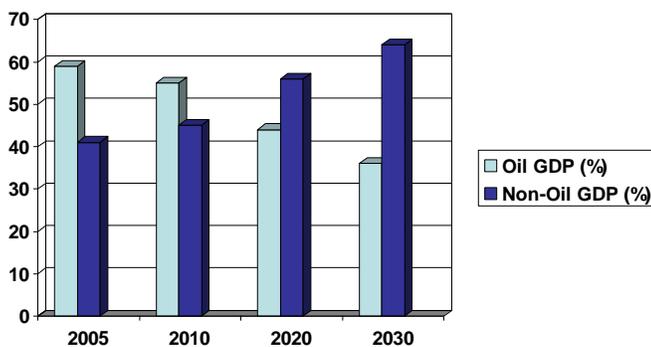
- Premium education for human capacity building
- Research and development, leading to innovation
- Commercialization of R&D results
- Creation of a sustainable knowledge-based economy

Elements of implementation of this vision include the creation of new educational institutions, investment in and acquisition of companies that are bringing diverse technological economic activities to Abu Dhabi, and the development of research activities and support mechanisms.

The chart below indicates the planned diversification of the Abu Dhabi economy by the year 2030 – reducing the dependence on oil GDP to 36%.

Target Abu Dhabi Economic Diversification

(Source: Abu Dhabi Economic Vision 2030)



Strategic investments

Mubadala has been created as a government owned company to develop new companies in Abu Dhabi. In operation for some six years, its portfolio of investments is currently valued at some \$15-billion. Mubadala has, for example, purchased the chip manufacturing facilities of AMD, and will be moving significant parts of that operation to Abu Dhabi as part of the initiative of developing high-tech manufacturing in the UAE. It also is making investments in aerospace research and development, and parts manufacture, in association with the major expansion of UAE airlines, including Etihad and Emirates.

The Masdar initiative, spawned by Mubadala, includes three major thrusts: investments in alternative energy to initiate the follow-on to the petroleum years as a major part of the UAE economy; development of a \$22-billion demonstration city which will be carbon neutral and be powered entirely by solar and wind energy; and establishment of the Masdar Institute of Science and technology, a graduate level specialty institution focused on research and education in alternative energies.

The Masdar Institute of Science and Technology is the educational component of the Masdar Initiative, a program established in 2006 by the Abu Dhabi government to develop a new economic sector in alternative and sustainable energy. The Masdar Institute is a graduate level institution, offering masters degree programs – and eventually doctoral programs -- in engineering and science disciplines. Current programs are Engineering Systems and Management, Information Technology, Materials Science and Engineering, Mechanical Engineering, and Water and Environment. It is a research-driven institute being developed with the support and cooperation of Massachusetts Institute of Technology. The Masdar Institute will be located in Masdar City, the zero carbon emission demonstration city being built at the edge of Abu Dhabi.

Saadiyat Island is being developed as a cultural center, for both tourist attraction and local education purposes. It will include five major cultural institutions: a branch of the Louvre Museum; a branch of the Guggenheim Museum; a national museum named after the founder of the UAE, H.H. Sheikh Zayed Bin Sultan Al Nahyan; a maritime museum; and a performing arts center. As part of this cultural center, a major branch campus of the New York University is under development.

New York University has long been committed to building its international presence, and had increased study-abroad sites to places such as Singapore, Accra and Buenos Aires. But the plan that has developed for a comprehensive, residential liberal-arts and sciences branch campus in the Arabian Gulf, set to open in 2010, is in a class by itself. The NYU/Abu Dhabi project will see a flow of professors and students between New York and Abu Dhabi, allowing seamless transfers. The NYU/Abu Dhabi project meets several needs of the US university, and simultaneously addresses a major goal of Abu Dhabi, to be identified as a hub of knowledge transmission and creation in the region, as well as attending to the need to build human capacity in its citizens and its significant expatriate population.

The Khalifa University of Science, Technology and Research is a new institution of higher education in Abu Dhabi, United Arab Emirates. It is an independent public university supported by the government of Abu Dhabi, focused on building the human capital needed for the economic development of the Emirate as it evolves from an oil-based economy to a diverse knowledge-driven economy. The University has been established to serve the Emirate of Abu Dhabi and the broader United Arab Emirates by providing high quality education, research and service. Upon entering the workplace, its graduates will contribute leadership to current and future industrial development and innovation. KUSTAR is fully co-educational, and educates both Emirati and international students. Its programs include undergraduate education, post-graduate education, and research and development.

Discussion

Building dynamic economies that are based on the creative application of human knowledge is currently an aspiration of all developing countries. The 22 countries of the Arab world, which lag behind other regions in educational achievement, technical advances, and economic development, are acutely aware of this challenge.

The United Nations Development Program has conducted two recent studies of the Arab world's progress in developing the knowledge, skills and institutions needed to compete in today's global economy. Its 2003 report presented a comprehensive picture of the "knowledge deficit", and suggested needed reforms. The 2008 report analyzes what has been achieved, what has failed, and what remains to be done. The 2008 report concludes that Arab countries as a group have made significant progress, when measured against their own histories. Significant success has been achieved in access to education, including new universities with global standards. And Arab governments have begun investing more in research and development.

Conclusion

Countries throughout the Persian Gulf region, and beyond in the Arab world, are striving to develop diverse economies which allow them to compete effectively in today's global economy. Much of the effort is appropriately directed to education and associated activities which aim toward building "knowledge-based" economies.

The Emirate of Abu Dhabi has embarked on a particularly enlightened and aggressive program of economic development, aimed at transforming its current oil-based economy to one based on knowledge and innovation. It is making substantial investments in higher education, particularly in engineering and science, to develop the human capacity to accomplish this transition.

References

- 1) See <http://www.qf.edu.qa/>

- 2) See <http://www.kaust.edu.sa/>
- 3) See <http://www.diacedu.ae/>
- 4) See <http://www.pi.ac.ae/>
- 5) See <http://www.nyit.edu>
- 6) The Government of Abu Dhabi, *Abu Dhabi Economic Vision 2030*, November 2008
- 7) See <http://www.mist.ac.ae/>
- 8) See <http://nyuad.nyu.edu/>
- 9) See <http://kustar.ac.ae/>
- 10) Kristin M. Lord, *A New Millennium of Knowledge?*, Saban Center at Brookings, Analysis Paper Number 12, April 2008, The Brookings Institution, Washington DC