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Building research capacity in the Gulf Cooperation Council countries: Strategy, funding and engagement

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Building Research Capacity in the Gulf Cooperation Council Countries: Strategy, Funding and Engagement

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The UN Arab Human Development Reports used numerous indicators as evidence of weak progress towards the development of knowledge economies in Arab States, and recommended the consolidation of knowledge acquisition and its effective utilization as one of three key drivers for progress. But the Arab States are not homogeneous and national differences in performance, trends and policy responses require more careful consideration. The Gulf Cooperation Council (GCC) countries have developed world levels of GDP per capita and yet investment in R&D remains at developing world levels. This paper reviews developments in research, development and innovation performance in the GCC since the early 2000s, analyses current developments in higher education, particularly in Qatar and the United Arab Emirates (UAE), and proposes strategies for improvement.

The most recent international indicators related to research capacity have shown little or no improvement for GCC countries. For example, the 2006 Global Competitiveness Index (World Economic Forum) ranking of 125 countries showed competitive disadvantages for participating GCC countries that included quality of scientific research institutions (ranked between 49-117), industry / university collaborations (ranked 60-121), availability of scientists and engineers (ranked 60-96) and company spending on R&D (ranked 42-116). Additionally, the 2006 World Bank Knowledge Economy Index showed all GCC countries rated below the world average for the Innovation sub-index and the Education sub-index world rankings improved for the UAE and Bahrain only.

The development of research capacity and production is highly dependent on higher education in these countries as the private sector funds little R&D (UNDP 2002).

With the exception of the UAE, funding of higher education is generally within or exceeds the range of 4-6% identified as optimal in developed economies (Steier 2003). And yet dis-satisfaction with the quality of education is high and research productivity is low. The UAE and Qatar have embraced cross-border delivery of higher education in recent years. The UAE has opened its doors to international providers and currently has at least 56 institutions in addition to the three federal institutions. Qatar has taken a different approach by inviting selected international institutions to establish single programs on one campus, with the stated vision of establishing Qatar as a leader in innovative education and research. The contribution to research capacity, production and utility of internationalized higher education is discussed.

The development of research capacity, production and dissemination cannot be analyzed in isolation of the economic development policy environment. Several GCC countries have adopted a cluster-based development strategy by developing themed free zones and industrial clusters with the purpose of building critical mass in strategic industries. This strategy requires a number of key elements to be successful, including a highly skilled workforce of engineers, technicians and scientists, and strong basic research infrastructure in universities. The failure to concurrently develop these areas along with the physical infrastructure leaves some doubt on the sustainability of these ventures given the competitive global marketplace for skilled labor.

An integrated approach to developing research capacity is needed and, in the case of the GCC, the resources are available. A concerted effort is needed to develop university / industry / government interaction to establish a coherent, prioritized, well funded research strategy. A strategy is also needed to engage GCC nationals in the research endeavor, at scientific, technical and management levels, to ensure sustainability and relevance. This can be achieved by developing research based graduate programs within countries and by providing incentives for nationals returning from overseas graduate degrees to enter research employment rather than government management positions. The engagement of nationals will ensure that research capacity is linked to the twin needs of economic development and national employment through entrepreneurship and innovation.

1. Introduction / Overview

1.1 Summary of the issue, essential facts and strategies for change

The UN Arab Human Development Reports of 2002 and 2003 painted a relatively bleak picture of progress towards the development of knowledge economies in Arab States (UNDP 2002, 2003), citing the poor quality of higher education and the low level of research productivity in higher education as key issues to be addressed. Although GCC countries have generally much higher levels of economic performance than other Arab States, they do not out-perform in indicators related to R&D in higher education and have not shown improved performance in those indicators over the past few years. However, GCC countries perform significantly better than other Arab States in other indicators relevant to innovation performance such as macro-economic performance, openness to trade, access to capital, retention of national professionals, infrastructure and access to ICT technologies.

A cohesive strategy is needed to improve R&D performance and will require, among other measures, a focused R&D strategy developed with key stakeholders, a strong engagement by the private sector in funding & conducting R&D, and government funding of research infrastructure, basic and applied research, and research degree programs. The experience of other "emerging innovators" can be used to fast-track the development of research capacity and productivity while ensuring it also addresses issues of national importance.

2. The Context and Issue in Detail

The Arab Human Development Reports (AHDR) of 2002 and 2003 cited numerous indicators as evidence of weak progress towards the development of knowledge economies in Arab States (UNDP 2002). Some of those key indicators were:

- expenditure per capita on education declined from 1985 to 1995;
- R&D expenditure averaged 0.4% GDP in 1995, compared to an average of 1.9% in the EU and ›2.5% in the most advanced R&D countries;
- average output of scientific papers per unit population was 2% that of an industrialized country;
- number of scientists and engineers working in R&D was 50% of the world average;
- proportion of Masters and PhD qualified researchers in the workforce was 3-10% the rates in developed countries;
- R&D was funded 89% by government and only 3% by private sector, compared to more than 50% private sector in OECD countries;

Primae facie, it may be expected that the oil producing nations of the GCC would perform better than other Arab States with much lower national incomes. And in some indicators, such as penetration of the internet, number of ISPs, websites and PCs per unit population, and in macro-economic development, GCC countries clearly outperformed other Arab States (UNDP 2002, 2003). But there is little or no difference in other indicatorss, such as tertiary enrolments, number of scientists and engineers in R&D, and number of research publications.

The Global Competitiveness Report 2006/07 released by the World Economic Forum provides a more recent opportunity to compare GCC countries to other Arab States (Table 1). Bahrain, Kuwait, Qatar and the United Arab Emirates have made significantly greater progress in developing macro-economic environments that are globally competitive; score more highly on Technological Readiness, reflecting the significant investment in ICT infrastructure that has been made; but continue to rank little or no better than other Arab States for Higher Education and Training, and Innovation (Table 1).

Table 1. Country ranks for selected Pillars and indicators from the Global Competitive Index 2006/07 (World Economic Forum 2006).

	Bahrain	Kuwait	Qatar	United Arab Emirates	GCC Average[1]	Other MENA Average[2]
Overall rank	49	44	38	32	41	58
Global Competitiveness Index Pillars						
Macro-economy	11	2	3	4	5	65
Higher Education & Training	64	59	46	58	57	67
Technological Readiness	41	46	39	31	39	72
Innovation	101	81	41	40	66	62
Selected Indicators (Higher Education related)						
Quality of scientific research institutions	117	57	49	60	71	74
University / Industry research collaboration	121	85	60	-	89	93
Quality of Educational System (HEd)	79	62	20	-	54	68
Quality of Math & Science Education	86	61	-	-	74	66
Local availability of Research & Training Services	96	53	57	-	69	80
Availability of scientists & engineers	96	63	80	80	80	27
Selected Indicators (non-Higher Education related)						
Company spend on R&D	116	81	42	42	70	75
Capacity for Innovation	119	110	61	72	91	93
Firm Level Technology Absorption	52	39	43	21	39	39
Intellectual Property Protection	46	58	27	-	44	57
Brain Drain	23	8	2	5	10	84
Venture capital availability	56	27	-	17	33	91
FDI & Technology Transfer	68	119	11	15	53	67

[1] Note: Saudi Arabia & Oman do not participate in the Global Competitiveness Index study

[2] Algeria, Egypt, Jordan, Morocco, Tunisia

Similarly, there is little difference between GCC countries and other Arab States in those indicators related specifically to higher education, training and research services, or to indicators related to companies, but the GCC clearly has advantages in retaining its national professionals and in the availability of capital (Table 1).

Data from the World Bank Knowledge Economy Index provide a similarly mixed result (Table 2). On average, the GCC spends a similar proportion of GDP on education to other

Arab States, although it is noted that there is wide disparity within each grouping. The GCC again demonstrates a clear advantage in indicators related to ICT penetration and infrastructure but the proportion of the population engaged in R&D is very low compared to other Arab States, although their productivity is apparently higher in terms of publications and patents.

Table 2. Selected Knowledge Economy Index indicators (Source: World Bank)

Variable	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	GCC Ave	Other MENA Ave [1]
Public spend on Education (%GDP)		6.1	4.6	3.6	8.3	1.6	4.8	4.1
Total spend on R&D (%GDP)		0.19						
Researchers in R&D / million		72.59	3.75				38.17	996.83
Scientific & Technical Articles / mil	44.21	112.97	38.74	33.62	27.25	45.58	51.63	25.21
Patent Applics (USPTO) / mil	0.00	1.63	0.00	0.00	0.65	0.70	0.50	0.18
Tertiary Enrollment	33.17	20.92	7.48	22.05	25.43	34.66	23.95	24.02
Computers / 1,000 people	163.70	173.40	40.20	214.90	340.10	119.90	175.37	39.46
Internet Users / 10,000 pop	2066.59	2312.14	834.75	2665.59	636.46	3185.00	1950.09	798.35

[1] Algeria, Egypt, Jordan, Lebanon, Morocco, Syria, Tunisia where data available

The overall context for research in higher education in the GCC countries can therefore be summarized as an environment in which variable but potentially adequate funding is being provided (UAE excepted), in which access to ICT and the availability of ICT infrastructure is relatively high, but in which research productivity, networks and quality are relatively poor and generally no better than that from other Arab States. It appears that the benefits of high GDP and GDP growth are not flowing towards the development of key knowledge society components (WEF 2006).

3. Policies & Programmes: National R&D and Higher Education policy frameworks

3.1 The current policy framework

The role of the State is clearly vital in building national innovation systems (Furman et al 2002). This is particularly so in Arab States where investment by the private sector in R&D is less than 3% of total R&D expenditure (UNDP 2003). It can be argued that State development of infrastructure, a macro-economic environment supportive of innovation, and investment in education in the GCC is generally adequate (Tables 1, 2). For example, an analysis of OECD countries that have emphasized the role of education in supporting economic growth proposed an expenditure of 4-6% GDP to be appropriate (Steier 2003), and all but one GCC country are spending between 3.6 and 8.3% GDP (Table 2). Yet the indicators of satisfaction with the quality of higher education and the delivery of research services suggests that this investment is not delivering the outcomes that it should (Table 1).

The higher education sector also has responsibilities in developing national innovative capacity, and it is clear that it is failing in several of these responsibilities in the GCC countries. The proportion of graduates in science, technology and engineering is much lower than countries that have emphasized R&D as a pathway to economic growth (UNDP 2002, 2003); research productivity, and therefore contribution to a national knowledge stock, is demonstrably low (Table 2); and there is relatively poor engagement with industry, with little research funded by the private sector.

3.2 Current programmes and projects: practical initiatives in progress

Two GCC countries, Qatar and the United Arab Emirates, are taking bold steps to develop their higher education and R&D sectors. Under the umbrella of the Qatar Foundation for

Education, Science and Community Development, Qatar has initiated a number of integrated programs, such as Education City, the Qatar Science & Technology Park (QSTP) and the Qatar National Research Fund (QNRF). The overall intent is to connect the private, academic and government sectors, the so-called Triple Helix (Etzkowitz and Leydesdorff, 2000), in collaborative R&D.

Education City is a community of universities and research centers to which leading universities such as Cornell, Georgetown, Texas A&M and Carnegie Mellon have been invited to establish their best-regarded programs. The programs offered by the universities are currently limited to undergraduate degrees but it is their intent to provide graduate degrees, research centers and industry research collaboration as facilities are completed and programs mature.

QSTP facilitates the engagement of the private sector with the universities, as a base for multi-national and national companies to establish research centers, and an opportunity for knowledge-based entrepreneurs to create new businesses. It has already attracted tenants such as EADS, Microsoft, ExxonMobil, GE and Shell, the latter of which is to set up a $100m gas-to-liquids research center. R&D is focused in areas related to the economy of Qatar, such as gas and petrochemicals, healthcare, information and communication technologies, water technologies, the environment and aircraft operations. QSTP also recently announced two venture-capital funds of $130m to help commercialize local innovations, and the QNRF will provide public funding needed to support basic and applied research.

In contrast to the approach in Qatar, the United Arab Emirates has opened its arms to educational institutions. There are currently 40 accredited universities, colleges and

academies in addition to the three Federal higher education institutions, and at least another 16 institutions have been established in free zones such as Knowledge Village in Dubai, which offer their own accreditation process and where national accreditation is not required.

The non-Federal institutions are a mix of for profit and non-profit entities that generally offer a limited range of baccalaureate and graduate degrees; include a number of international universities from the UK, France, Canada and Australia that have established branch campuses, as well as local and on-line institutions; and are primarily undergraduate teaching institutions offering little in the context of research training through graduate degrees or through knowledge generation in their own right.

The economic development strategy in the UAE, particularly the Emirate of Dubai, has been to establish "themed" industrial clusters with free-zone benefits to attract a critical mass of related industries. Some, such as Dubai Biotechnology and Research Park, Dubai TechnoPark and Dubai Silicon Oasis, promote linkages with local academic institutions as well as incorporating university campuses within the free-zone, and offer services such as shared facilities and equipment, incubation centers and support with government relations.

4. Analysis

Qatar and the United Arab Emirates have taken different approaches to developing their higher education sectors and the impact on university research capacity and productivity may ultimately differ. Qatar has strategically selected its international partner universities and co-located them with multi-national firms and industrial research centers. It is also providing funding mechanisms through the Research Foundation and venture-capital funds to support

basic and applied research as well commercialization. Over time, the Qatar initiatives will be a success to the extent they develop indigenous research capacity through knowledge transfer.

The UAE's open door policy to new universities allows institutions to determine the programmes that they offer, based on student demand and willingness to pay. Not surprisingly, the majority of undergraduate programmes are business and IT related and MBAs are the commonest graduate program. There is currently no national research policy or funding mechanism, although the initiatives of the Emirates Foundation, established in April 2005, may lead to such a programme.

The UAE currently has very few research degrees that will provide a supply of skilled researchers and scientists and it is unlikely that newly established for-profit institutions will provide these degrees in the future. This is likely to continue the reliance on imported professionals to support its R&D capacity. The outcomes in Qatar may be more fruitful provided that the universities develop fully-fledged graduate research programmes. The experiment is too young to assess.

5. Recommendations: Challenges for change

There are several significant policy related initiatives that GCC countries could take to support R&D in higher education. The first is development of a national R&D policy / strategy, developed through consultation with government, industry and academic stakeholders, and in the context of a globally connected market and workforce.

The second factor is the establishment of stronger linkages between academia, government and industry, and the facilitation of greater private sector funding of university research. The

former may be achieved through initiatives such as joint research task-forces to develop and evaluate R&D strategy, and the latter through mechanisms such as matched government funding and financial incentives. Private sector involvement in and funding of research will focus R&D activity in areas of commercial value and positively impact the utility of research conducted in the GCC. In this regard, the co-location of universities and industry in Qatar shows promise.

A strategy is also needed to engage GCC nationals in the research endeavor, at scientific, technical and management levels. This can be helped by developing research based graduate programs within these countries, and by providing incentives for nationals returning from overseas graduate degrees to enter research employment rather than government management positions. The engagement of nationals will ensure that research capacity is linked to both of economic development and national employment through entrepreneurship and innovation.

Finally, and somewhat more intangibly, is the cultivation of a culture of enquiry, risk-taking and entrepreneurship. "An R&D culture grows out of a social infrastructure of experimentation and entrepreneurship with solid recognition of achievement and appropriate rewards" (UNDP 2003). The past ability to rely on the State to provide employment has reduced risk-taking, with a very low rate of nationals engaged in entrepreneurial activity (UAE unpubl. data). Notably, the most common barrier to participation in this activity was cited as risk of failure.

The key determinants for driving national innovative capacity include strong basic research capacity in higher education, skilled scientists and researchers available locally, strong linkages between industry and academia, and a supportive regulatory and economic

environment (Furman et. al. 2002). The different paths taken by both Qatar and the United Arab Emirates are a positive sign of pro-activity and will make for interesting comparisons as they develop. Their success will depend on strong knowledge transfer and local capacity building to break the cycle of reliance on foreign expertise. More generally in the GCC, the resources are available to develop innovative economies and strong R&D communities and other "emerging innovators" have demonstrated that a strategic approach can significantly shorten the development time for progress (Furman and Hayes 2004).

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