Technological readiness in the United Arab Emirates towards global competitiveness

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Abstract

Purpose – This paper aims to assess and evaluate the United Arab Emirates' performance in terms of global competitiveness and technological readiness. This paper aims to critically examine the impact of Information and Communication Technologies (ICTs) and education on improving the technological readiness in UAE.

Design/methodology/approach – A situational analysis and a comparative approach were exploited to describe the UAE's position in terms of global competitiveness, highlighting weaknesses, strengths and opportunities. Related discussions were supported by data from several international sources. The country's worldwide performance was particularly matched against that of the other members of the Gulf Cooperation Council (GCC) together with few more Asian transformation economies.

Findings – Apparently, the UAE has made important progress in the Global Competitiveness Index (GCI) in the last six years particularly at the macro-economic environment and quality of infrastructure levels, notably the ICT sector. Empowering the nation with education and ICTs could increase productivity and competitiveness of UAE worldwide. However, the county is still lagging behind most transformation economies and facing considerable challenges with regards to technological readiness. This hurdle impeded the country's ability to absorb, adapt and create new technology and knowledge. As a result, the country's economy is experiencing a negative trade balance in foreign technology transfer. The comparative and situational analysis methodology adopted in the context concluded several lessons and policy remarks.

Originality/value – Using the most updated data, this exercise stems from the country's need to examine the current status, a necessary step for realization of new prospects and adoption and application of future policies and programs.

Keywords GCI, Technological readiness, Technology products, ICTs, Technology transfer, Education, GCC countries, Trade, Information technology, United Arab Emirates

Paper type Research paper

1. Background and objectives

United Arab Emirates (UAE), a member state of the Gulf Cooperation Council (GCC), has enjoyed an impressive economic growth over the last few years, with sustainable rise in growth domestic product (GDP) per capita ranging from US$18.5 thousands in 1990 to 67,008 thousands in 2011, apparently coinciding with high oil revenues and high growth in the labor force (see GCI report 2012-2013). Moreover UAE Vision 2021 advocates increasing investment in science, technology and innovation and research and development (R&D).

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Table I, presents the performance of UAE against the rest of the world and Arab/Muslim countries using different international indicators and measurements. These various global indicators will help in understanding the position of UAE according to a set of measures that are recognized internationally. Using various international reports and databases, Table I compares the UAE's performance (world ranking) with the rest of the world with regard to the most widely accepted indexes such as human development index (HDI)[1]; gross national income (GNI)[2]; knowledge economy index (KEI)[3]; global innovation index (GII)[4]; global competitiveness index (GCI)[5]; and environmental performance index (EPI)[6].

The main objective of this paper is to assess and evaluate the UAE's performance in terms of global competitiveness and technological readiness. In this paper, we have taken a somewhat extensive review of the different aspects of technology (products, transfer, ICTs, etc.) in UAE. Given the current slow progress in UAE's technological readiness compare to the rest of the world a number of fundamental research questions are addressed:

RQ1. What are the consequences of the current poor technological readiness in UAE?

RQ2. To what extent are policy makers responsive to the current needs of improving technological readiness and capabilities in UAE?

RQ3. What are the opportunities and challenges of ICTs and education for improving the technological readiness in UAE?

RQ4. What are the policy implications of the answers to the above-stated questions?

The rest of the paper develops as follows. Section 2 lays the study methodology and data sources. Section 3 evaluates in detail the country's global competitiveness with critical assessment of UAE technological readiness with respect to global competitiveness and several other KE indicators. Section 4 draws some concluding remarks, lessons and policy recommendations.

2. Methodology and data sources

A situational analysis and a comparative approach were exploited to describe the UAE's position in terms of global competitiveness, highlighting weaknesses, strengths

Countries	HDI 2011	GNI 2011	KEI 2012	GII 2011	GCI 2012	EPI 2012
World top	0.943	–	9.43	63.82	5.74	76.69
World bottom	0.343	–	0.96	19.79	2.87	25.32
World average	0.682	10,082	5.12	–	–	–
Arab average	0.641	8,554	4.74	–	–	–
United Arab Emirates	0.846	59,993	6.94	41.99	4.89	50.91

Notes: HDI (value – 187 countries); GNI (constant 2005 PPP $ – 187 countries); KEI (value – 146 countries); GII (value – 125 countries); GCI (score – 142 countries); EPI (score – 132 countries)
Sources: Adopted from GCRs (2006-2013), World Bank (2012), INSEAD (2011), (The) Global Innovation Index (2011), ITU World Telecommunication Indicators Database (2006a, b, 2007, 2009, 2010, 2011, 2012a, b), Yale Centre for Environmental Law and Policy, Yale University (various years)

Table I. UAE performance vs the world (latest reports/data)

and opportunities. In particular, the exercise evaluated the UAE experience within its GCC regional domain together with that of few examples from transformation economies such as Singapore and the Republic of Korea. The UAE global competitiveness and related analysis and discussions drew on the most recently available data sources and measures from the World Economic Forum (WEF) various reports 2006-2013 Global Competitiveness Reports (GCR). Figure 1 illustrates the various components (categories, pillars and factors) of the GCI framework.

3. Technological readiness

Table II adopted from the WEF various reports (GCR, 2006-2013), shows the percentage changes in UAE GCI performance worldwide. According to the analysis in Table II, UAE performance has been the best within the MENA region for almost all the six years investigated in this study except in few parameters. In 2006, UAE is only lower than Algeria in the third pillar (macro-economic environment); also UAE ranked 27th worldwide in 2011, slipping two positions from 2010 to 2011 ranking, below Qatar (14th) and Saudi Arabia (17th).

However, elaborating on the UAE loss of two places for the second year in a row, the recent GC reports identified a number of areas of deterioration. The most noticeable was the country's loss of ability to use latest technology for productivity improvements, which goes in line with the issue of unskilled labor in the country, highlighted in the other sections of this paper. Table III provides more details about the various factors impacting UAE technological readiness pillar as a percent change between 2006 and 2012.

The most noticeable decline was in the "technological readiness" pillar from position 14 in 2010 to position 30 in 2011 and position 32 in 2012 (see Table IV).

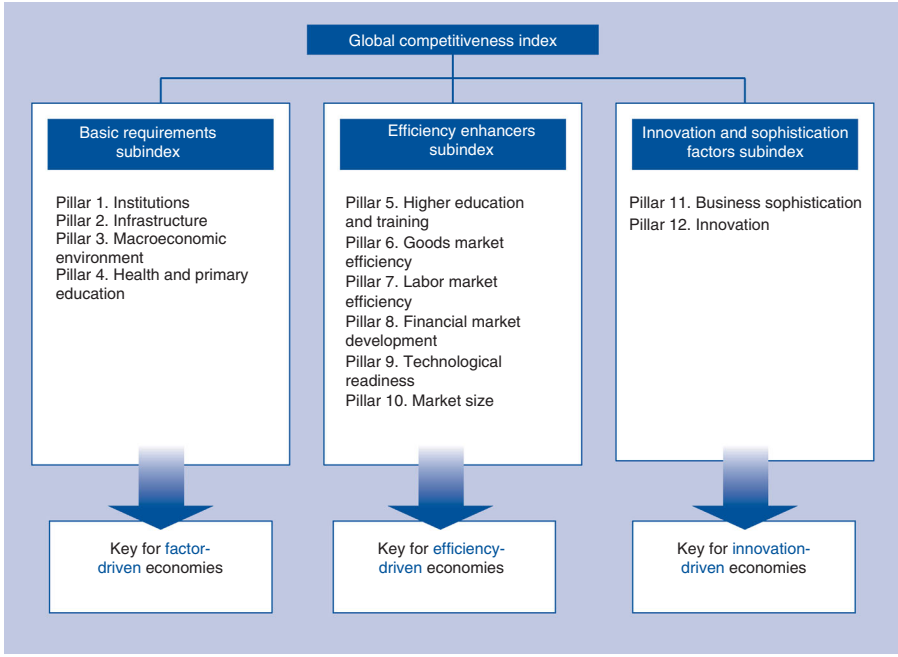

Figure 1.
The global competitiveness index framework

	2006	2012	% change
Overall GCI	37	24	13
Basic requirements	21	5	16
1st pillar: institutions	24	12	12
2nd pillar: infrastructure	17	8	9
3rd pillar: macroeconomic environment	7	7	0
4th pillar: health and primary education	84	37	47
Efficiency enhancers	38	21	17
5th pillar: higher education and training	57	37	20
6th pillar: goods market efficiency	27	5	22
7th pillar: labor market efficiency	22	7	15
8th pillar: financial market development	48	25	23
9th pillar: technological readiness	35	32	3
10th pillar: market size	51	44	7
Innovation and sophistication factors	39	25	14
11th pillar: business sophistication	31	15	16
12th pillar: innovation	48	28	20

Source: Adopted from World Economic Forum (Global Competitiveness Reports, 2006-2013)

Table II. Percent change of UAE GCI (2006-2012)

	2006	2012	% change
Technological readiness	35	32	3
Availability of latest technologies	14	23	−9
Firm-level technology absorption	20	12	8
FDI and technology transfer	25	6	19
Individuals using internet (%)	36	34	2
Broadband internet subscriptions/100 population	43	52	−9
Intel internet bandwidth, kb/s per user	–	48	–
Mobile broadband subscriptions/100 population	–	44	–

Source: Adopted from World Economic Forum (Global Competitiveness Reports, 2006-2013)

Table III. Details analysis (percent change) of UAE technological readiness (2006-2012)

	2012	2011	2010	2009	2008	2007	2006
Technological readiness	32	30	14	17	28	33	35
Availability of latest technologies	23	25	11	8	17	16	14
Firm-level technology absorption	12	16	5	4	14	17	20
FDI and technology transfer	6	10	6	6	15	13	25
Individuals using internet (%)	34	19	10	2	37	37	36
Broadband internet subscriptions/100 population	52	49	39	40	43	45	43

Source: Adopted from World Economic Forum (Global Competitiveness Reports, 2006-2013)

Table IV. UAE technological readiness pillar (2006-2012)

This drop in the "technological readiness" pillar, however, could mean that others have developed technologically in a faster rhythm than the UAE.

However in the context, Bachellerie (2010) debated the classification of the UAE by the WEF GC report as an "innovation-driven economy." Arguing that the UAE has

only satisfied the "factor-driven" stage of competitiveness, characterized by high performance in infrastructure and macro-economic environment, yet, it does not show strong performance that qualify membership of the second stage, "efficiency-driven economy." Within the GC context, the efficiency-driven stage is realized by high performance in indicators such as availability of latest technologies, firm-level technology absorption and FDI and technology transfer, all of which reported low scores in the UAE compared to countries that have achieved the innovation-driven stage. According to WEF GC report, the efficiency-driven stage entails maintenance of competitiveness through design and development of cutting-edge products and processes in an environment that is conducive to innovative activities, supported by adequate public and private sector investments in R&D that brings together collaboration between research institutions and the industry.

3.1 Technology products

As stated earlier, one of the downsides, cited by the WFE GC report 2011-2012, affecting the UAE competitiveness was the country's inability to adapt and absorb exogenous technology for productivity improvements. Bachellerie (2010) reported an increasing domestic demand for technology products and equipment matched with insufficient domestic production, leading to high dependency on foreign technology imports, consequently impacting on the national balance of trade.

Table V displays the size of imports and exports of technology products defined according to Revision 3 of the Standard International Trade Classification (SITC) retrieved from the World Trade Organization Statistical Database (2011), for the UAE, the rest of the GCC countries and other selected countries. These products mainly cover SITC sections 5, 6, 7, 8 minus division 68 and group 891; namely iron and steel, chemical products, machinery and transport equipment and others. The UAE technology products' trade balance reported a trade deficit (exports minus imports) amounting to US$43.01 billion in 2010, the second highest after Saudi Arabia (KSA) when compared to its GCC counterparts (Table V). The UAE position reflects insufficient domestic technology production to cover domestic needs, contrasting the positions of Singapore and the Republic of Korea who succeeded in sustaining trade surplus in technology products (Table V).

Country	Technology products export	Technology products import	Trade balance	Trade balance as % of fuel and mining products surplus	Technology products exports as a % of total exports	Technology products imports as a % of total imports	Deficit in technology products trade as a % of GDP
UAE	52.76	95.77	−43.01	60.6	24.0	59.9	14.2
Qatar	3.34	20.47	−17.13	33.2	5.4	88.1	13.5
Bahrain	1.41	6.17	−4.76	49.0	10.3	61.7	21.0
Kuwait	4.83	18.30	−13.47	22.0	7.2	81.5	10.2
KSA	29.17	77.54	−48.37	23.6	11.7	79.9	10.8
Oman	3.97	14.18	−10.21	41.4	10.8	71.4	17.6
Singapore	254.20	201.75	52.45	–	72.2	64.9	–
Korea	411.53	239.62	171.91	–	88.2	56.4	–

Source: International Monetary Fund

Table V.
Technology products imports and exports in GCC and other selected countries, 2010

The UAE 2010 trade deficit in technology products represented about 14.2 percent of the country's GDP, third after Bahrain and Oman, eroding about 61.0 percent of the trade surplus in fuel and mining products (see Table V). Despite this gloomy outcome, the UAE commands the highest percentage of exports in technology products (24.0 percent) compared to other GCC countries. Needless to say that the UAE exports figures include technology re-exports, implying that only a segment of these exports are domestically produced (Bachellerie, 2010).

3.2 Technology transfer

The UAE demand for and dependency on foreign technology generated a negative upward trend of technology transfer. As illustrated in Figure 2, the size of technology products trade deficit seemed to grow exponentially ($R^2 = 0.90$) over the period 1980-2010. Although the deficit is still high, it is noteworthy to mention that the big jump taken place during the 2008 crisis came to settle down to pre-2008 figures as depicted in Figure 2. Excluding fuel and mining trade surplus (US$71.0 billion) from the national trade balance (US$60.0 billion) for 2010, the country would have run into a deficit of US$11.0 billion. This demonstrates the importance of trade in technology products in determining the country's balance of trade and underscores the lack of innovative activities and inability of the UAE economy to assimilate and create new knowledge and technologies that cater for domestic needs.

Establishing an innovation system of network of institutions, rules and procedures that influences the way by which a country acquires, creates, disseminates and uses knowledge and technology is essential for the sustainability of economic growth (Chen and Dahlman, 2006). Innovation is mainly realized through strong performance of the education system, efficient R&D activities with support coming from both the public and private sectors and availability of venture capital and intellectual property protection.

In terms of "basic requirements" for global competitiveness which include macro-economic environment and availability of infrastructure, and based on the recent GCR (2006-2013), the UAE ranked among the top five countries in the world, above the rest of the GCC countries. However, the country occupied the 22nd and above the rest of the GCC countries in the "efficiency enhancers" category; summarized by an index formed of several indicators including the country's technological readiness.

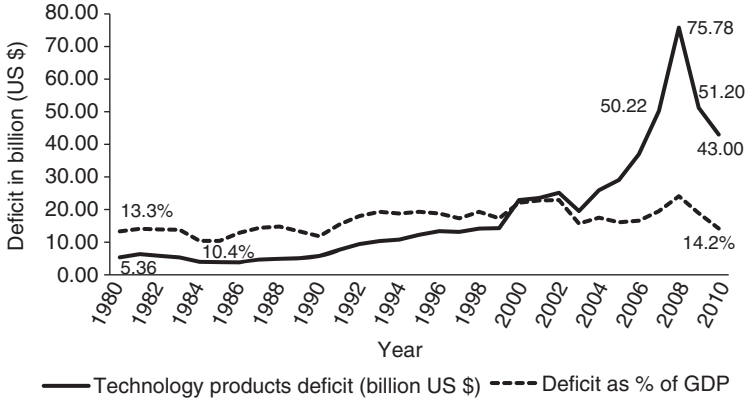

Figure 2.
UAE technology products deficit (in billions US $) and the percentage of deficits of the GDP

Moreover the UAE performance in government procurement of advanced technology products ranked fifth worldwide, after Qatar (first), Singapore (second), Saudi Arabia (third) and Malaysia (fourth) in 2011. All other GCC countries were within the top 20 countries, except Kuwait which ranked 97th. The strong gain maintained by the UAE suggests that procurement decisions in the country foster technological innovations.

3.3 ICTs

There is enormous variety in the socioeconomic context of Arab countries, and a related large variability between them in terms of their current status with respect to ICTs, in areas such as their existing equipment base, the availability of trained personnel and their current levels of usage of IT/S. According to the latest digital opportunity index (DOI)[7] and WEF reports (2011), the UAE continues to lead the Arab world in the adoption of ICTs and it was expected to spend about US$3.3 billion on ICTs hardware for schools, hospitals and other civil projects for the period 2008-2011. The index also reveals an alarming picture for many countries in the region moving backward across the table from 2005 to 2011 world ranking. The ranking of rich countries like Kuwait (moved from 49th in 2005 to 60th in 2006) and Saudi Arabia (moved from 72nd place in 2005 to 75th place in 2006) showing that a nation's economic status does not always correspond to its path toward the information society. Ahmed (2005) and Ahmed and Al-Roubaie (2012) argue that technology development is embedded in a country's history, cultural values and attitudes. Therefore, attitude to ICTs could also have something to do with national culture.

Moreover, based on the most recent data from the World Bank Knowledge Assessment Methodology (www.worldbank.org/kam), UAE has reported the highest penetration rate of 2.1 telephones per 1,000 population compared to all other GCC countries, Singapore and the Republic of Korea (see World Bank, 2008, 2009, 2012). It also reported the highest rates of computers (330 per 1,000 population) and internet users (520 per 1,000 population) among other GCC countries, yet lower than Singapore (740 and 660 per 1,000 population, respectively) and the Republic of Korea (580 and 760 per 1,000 population, respectively).

3.4 Education and skills

The executive opinion survey of the WEF of 2011-2012, revealed that, from a list of 15 factors, inadequately educated workforce represent the third top problematic factor for doing business in the UAE. Quantity and quality of education, however, particularly basic education, are important prerequisites for increasing productivity and work efficiency. A work force with little formal education is inclined to producing limited simple manual products, lacking the right skills and capability to absorb new technology and generate new ideas and innovations that promote productivity and bring about new products.

Recent growth in the UAE economy was marked by an increase in low skilled and low pay labor force (Abdalla *et al.*, 2010). According to the last UAE census in 2005, foreign workers represent more than 92 percent of employed workforce, around 11 percent are illiterates, 16 percent are able to read and write and around 53 percent have an education level between primary and secondary. Slightly more than 20 percent have an educational level above secondary school (diploma, university degree, masters degree or PhD). Assuming that workers with secondary education or above are skilled, Al-Awad (2010) indicated that the percentage of unskilled workers in the UAE

represent 80 percent of the employed labor force (also see Wilson, 2010). If left to market forces, profit maximizing employers in the private sector will prefer to continue to hire foreign workers at a significantly lower wage rates.

However, building a modern KE requires more investment in acquiring advanced technologies and high levels of competency in the workforce (see Aubert and Reiffers, 2003). Today's globalizing economy requires countries to nurture pools of well-educated workers who are able to adapt rapidly to their changing environment and the evolving needs of the production system (GCR, 2006-2013). The UAE is, therefore, in a great need to have in place a mix of policies and plans that can help shift up the skill level of the labor force in the country.

4. Conclusions and policy recommendations

The analysis and discussion conducted throughout this paper drew on several international data sources that provided the basis for demonstrating the UAE's technological readiness and capacity to compete in the global economy. The country's performance was evaluated worldwide and benchmarked against that of neighboring GCC countries together with few Asian transformation economies.

Evidence reveals a positive progression of the UAE in transitioning toward the innovation-driven stage; characterized by a high performance macro-economic environment and a high-quality infrastructure, particularly in the ICTs sector. However, several issues remain a concern and challenges remain to be addressed. In recent years, the country's economy experienced slow technological readiness and negative trade trends in foreign technology transfer, exhibited low investments in education and R&D activities and a lack of ability to absorb, adapt and create new technology and knowledge.

The UAE needs to increase its investment in education and R&D activities by increasing public expenditure, at least to match industrialized nations' minimum level, and by encouraging more private sector contributions. Investment in the education and the R&D sectors should be coupled with strategic reforms that ensure aligning learning and research outcomes to meet labor market demands and KE requirements. Particular focus should concentrate on strengthening technical and vocational training and revamping of curricula, particularly, at the higher education level, where learning outcomes should emphasize promotion of critical thinking skills together with creativity and problem-solving capacities. This is instrumental in providing high-skilled professional workforce to counteract the current mismatch in supply and demand in the country's human resources. It is also instrumental in providing R&D manpower required to improve the country's ability to adapt and assimilate new technologies and to develop an innovation base. UAE investment in knowledge inputs would benefit the country's competitiveness standing and would increase its chances of achieving sustained productivity growth as a result of increasing the indigenous innovation and the domestic value added of its goods and exports.

Overall, the country's commitment to transitioning to a KE is receiving the required political backing and is further supported by availability of significant financial resources and wealth that can play proactive part in realizing the KE vision. The key to achieving sustainable economic growth and stability, however, hinges on the optimal utilization of these assets in production and development, embracing the KE fundamentals and promoting entrepreneurship, innovation and global competitiveness.

Notes

1. HDI: a composite index measuring average achievement in three basic dimensions of human development – a long and healthy life, knowledge and a decent standard of living.
2. GNI per capita: aggregate income of an economy generated by its production and its ownership of factors of production, less the incomes paid for the use of factors of production owned by the rest of the world, converted to international dollars using purchasing power parity rates, divided by midyear population.
3. The World Bank's KEI is an aggregate index representing a country's or region's overall preparedness to compete in the knowledge economy (KE). The KEI is based on a simple average of four sub-indexes, which represent the four pillars of the KE: economic incentive and institutional regime; innovation and technological adoption; education and training; and information and communications technologies (ICT) infrastructure.
4. GII 2011 published by INSEAD in collaboration with its knowledge partners (Alcatel-Lucent, Booz and Company, the Confederation of Indian Industry and the World Intellectual Property Organization), covers 125 economies, accounting for 93.2 percent of the world's population and 98.0 percent of the world's GDP (in current US dollars). GII ranks 125 countries/economies across the world in terms of their innovation capabilities and results.
5. The GCI rankings are drawn from a combination of publicly available hard data and the results of the executive opinion survey, a comprehensive annual survey conducted by the WEF, together with its network of partner institutes (leading research institutes and business organizations) in the region.
6. The 2012 EPI ranks 132 countries on 22 performance indicators in ten policy categories and two overarching objectives that reflect facets of environmental health and ecosystem vitality. These indicators provide a gauge of how close countries are to environmental policy goals. The pilot trend EPI reflects changes in environmental performance over the period 2000-2010.
7. The DOI is a standard tool that governments, operators, development agencies, researchers and others can use to measure the digital divide and compare ICT performance within and across countries.

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