

## Saudi Arabia: A future regional hub for advanced education, research, science and technology

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### Abstract

Saudi Arabia is the largest country of the Arabian Peninsula, blessed with significant natural resources, including oil, gas and minerals. Saudi Arabia has recognised the importance of education in social and economic transformation, and has established a large number of universities, research and advanced technical institutes which have broken the metropolitan boundaries and have been extended to the far-flung areas of the country. There are 68 universities and degree-awarding institutes. The educational budget reached its highest-ever level of \$56.56 billion for the year 2014. About 124,000 Saudi students are pursuing higher education in about 500 universities around the world. Saudi Arabia produced 177826 research papers in Institute for Scientific Information (ISI) database and in the year 2014 alone, 26168 research papers were published in indexed science journals with a rising h-index of 144. The country is turning into a regional hub for advanced education, research, science and technology while swiftly shifting from an oil-based to a knowledge-based economy.

**Keywords:** Education, Research, Science, Technology, Saudi Arabia.

### Introduction

The Kingdom of Saudi Arabia is the largest country of the Arabian Peninsula with an estimated population of 29.19 million.<sup>1</sup> The country is sanctified with significant natural resources, including oil, gas and minerals with soaring income advantages. The Saudi government recognises the significance of education, research, science and technology in economic transformation and is motivated to encourage science and technology in the country. Saudi Arabia has devoted special attention to higher education. Presently, the country has the largest ever educational industry, representing a countrywide educational system providing free education and training from pre-school to university to all citizens.

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### Allocation of budget for education

Over the last six years, Saudi Arabia has continuously been increasing funding for education. The education budget was \$28.12 billion in 2008, \$32.62 billion in 2009, \$36.63 billion in 2010 and \$45.18 billion in 2011. In addition, a supplement of \$21.8 billion was also injected to establish new universities and research institutes. The educational budget reached the highest-ever level of \$56.56 billion for the year 2014.<sup>2</sup>

### Universities and degree-awarding institutes

The government of Saudi Arabia has made tremendous efforts to enhance the country's educational system by introducing new educational programmes and the construction of numerous schools and universities. The Saudi government is fostering education and technology in the country instead of relying only on an oil-based economy. For sustainable development they are focusing more on education and technology reforms to establish a knowledge-based economy.<sup>3</sup> One distinctive aspect of this strategy is to develop a world class research-oriented university in the region and link the research with industrial development through its technology incubators.<sup>4</sup>

Since the last six years, Saudi Arabia has established a large number of universities (Tables-1 and 2), degree-awarding and modern technical institutes which have broken cosmopolitan boundaries and have been extended to the far-flung areas of the country. Presently there are 68 degree-awarding universities and institutes.<sup>5,6</sup> The first university in the history of Saudi Arabia was the King Saud University, Riyadh, established in 1957 (Table-1).

Saudi universities, including King Saud University (KSU), Riyadh, King Fahd University for Petroleum and Minerals (KFUPM), Dammam, King Abdul Aziz University (KAU), Jeddah, and King Abdullah University for Science and Technology (KAUST), Thawl, have achieved reputable positions in the world both in academics and in research. KSU-Riyadh is ranked the first among Muslim countries and within the top 300 in the world.<sup>7</sup> World-class research-oriented KAUST, established in 2009, in its

**Table-1:** List of universities with their location and year of establishment in the Kingdom of Saudi Arabia.

University	City	Year
1. King Saud University	Riyadh	1957
2. Islamic University of Medina	Medina	1961
3. King Fahd University for Petroleum and Minerals	Dhahran	1963
4. King Abdul Aziz University	Jeddah	1967
5. Princes Nora Bint Abdulrahman University	Riyadh	1970
6. Imam Muhammad bin Saud Islamic University 35872	Riyadh	1974
7. University of Dammam	Dammam	1975
8. King Faisal University	Al-Hassa	1975
9. Umm Al-Qura University	Mekkah	1979
10. King Khalid University	Abha	1998
11. Effat University	Jeddah	1999
12. Arab Open University	Riyadh	2002
13. Prince Sultan University	Riyadh	2003
14. Fahad Bin Sultan University	Tabuk	2003
15. Qassim University	Al-Qassim	2004
16. Taif University	Taif	2004
17. Al Yamamah University	Riyadh	2004
18. Naif Arab University for Security Services	Riyadh	2004
19. Taibah University	Medina	2005
20. King Saud bin Abdulaziz University for Health Sciences	Riyadh	2005
21. Jazan University	Jizan	2005
22. Dar Al Uloom University	Riyadh	2005
23. Al Jawf University	Sakakah	2005
24. University College of Jubail	Jubail	2006
25. Arab open University	Dammam	2006
26. Prince Mohammad University	Khobar	2006
27. University of Hail	Hail	2006
28. Al Baha University	Al-Baha	2006
29. Najran University	Najran	2006
30. Arab open University	Jeddah	2006
31. Tabuk University	Tabuk	2006
32. Alfaisal University	Riyadh	2007
33. Al Hudud ash Shamaliyah University	Arar	2007
34. King Abdullah University of Science and Technology	Thuwal	2009
35. Salman bin abdraziz university	Al Kharj	2009
36. Sulaiman Al-Rajhi University	Al Qasim	2009
37. Al-Kharj University	Al-Kharj	2010
38. Shaqra University	Shagra	2010
39. Al Majma'ah University	AlMajma'ah	2010
40. Saudi Electronic University	Riyadh	2011

Note: There are about 35 more degree-awarding institutes.

infancy has achieved a reputable position in the global science community.

In Saudi Arabia, women are also dynamically pursuing higher education and careers in science, and seeking to become active members of society. Saudi Arabia established the Princess Noura bint Abdul Rahman University for women which encompasses 15 colleges and several departments. This is the world's largest university for women.<sup>8</sup> There are about 52,308 female

**Table-2:** Number of universities and degree-awarding institutes, research publication, citations, Institute for Scientific Information (ISI) indexed journals and number of Saudi students perusing education at national and international universities.

Universities and Degree Awarding Institutes	68
Number of student studying abroad	124000
Number of students studying in Saudi Universities	668000
Total number of publications	161717 (ISI-all data base) <sup>14</sup> 84922 (ISI- web of science) <sup>14</sup>
Citable documents	71129 <sup>13</sup>
Citations per documents	8.09 <sup>13</sup>
ISI Indexed journal	9 <sup>14</sup>
Country H- Index	144 <sup>13</sup>

List of Universities: <http://univ.cc/world.php5>

Research documents, citable documents, citation per documents and H-index<sup>13</sup>

ISI Indexed journals<sup>14</sup>

students enrolled with the university, and, of them, 777 are in postgraduate programmes and 331 are enrolled with doctoral programmes.<sup>9</sup> In addition, more than 300 colleges exist for females in the country alongside universities. Female students are also participating enthusiastically in medical sciences. A large number of Saudi female medical students are enrolled in doctoral programmes in science, especially in medical sciences.

### Student Enrollment

As per available literature, a total of 636,245 (268,080[42%] male and 368,165[58%] female) students were enrolled in higher education in 2006. Among them, 528,146 students (187,489[35.5%] male and 340,657[64.5%] female) were in undergraduate degree programmes, 9,768 students (5,551[57%] male and 4,217[43%] female) were in postgraduate programmes, and 2,410 students (1,293[53.6%] male and 1,117[46.4%] female) were in Doctorate (Ph.D) programmes. Additionally 93,968 students (72,199 [male [77%] and 21,769[23%] female) were in basic Diploma courses, and 1,953 students (1,548[79%] male and 405[21%] female) were in Higher Diploma course.<sup>10</sup> The number of students enrolled in all Saudi universities, and pursuing their studies in international universities approached 800,000 students in 2013.

### University attending cost

In the Kingdom of Saudi Arabia, the cost of attending public-sector schools, colleges and universities is zero, and such a figure is heard globally once in a blue moon. Furthermore, one of the remarkable features of education is that the government pays all expenses and students receive monthly grants, and also meals at negligible charges. In addition, the government also provides fully sponsored scholarships for higher studies within the

country and abroad. Most of the students for higher studies move to the United States, Britain, Ireland, Australia and Malaysia.

### Scholarship programme for higher studies

The Saudi government has placed a high primacy on education, especially postgraduation for its citizens. Saudi Arabia has established educational cultural bureaus in consulate offices in many countries. These bureaus are tasked with providing detailed amenities in all aspects of the postgraduate admission process, starting from a university and degree programme selection, admission process, academic monitoring, to providing a full range of assistance in the daily life of students and trainees. The cultural bureaus in various Saudi embassies have placed their primary focus on the postgraduate education of Saudi students in a vast number of science and social sciences programmes. The Saudi government fully sponsors its students for postgraduate studies. In addition to enrolling the students in the national universities, King Abdullah scholarship programme was started in 2005 with a substantial amount of \$2.4 billion each year. Under this programme, 124,000 Saudi students are pursuing higher education in some 500 universities around the world.<sup>2</sup> The students are mainly studying in USA (38,936; 31.4%), UK (17,608; 14.2%), Canada (13,516; 10.9%), Australia (9828; 7.2%) and other countries, including Ireland and Malaysia and some in Pakistan and India. Studying abroad enables them to build networks with international peers.<sup>4</sup> Among these students, 69% (n=85560) are males and 31% (n=38440) females, 44.67% (n=55391) are pursuing bachelor's degrees, 21.08% (n=26139) master's degrees, 4.74% (n=5878) are completing their Ph.Ds, and the rest are involved in other subjects.<sup>2</sup>

### International collaboration

Saudi universities have collaborated with science and talent-rich institutes and incorporated well-trained scientists from these institutions to increase research productivity. At present, KSU-Riyadh has four laureates as visiting faculty. Several Nobel Prize awardees from various disciplines of Medicine, Physics, Chemistry and Economics have visited and shared research ideas with students and faculty. Furthermore, hundreds of legendary scientists from all over the world, who are credited with an excellent track of research, high impact factor and h-indexed in various science subjects, are visiting faculty to guide the research fellows. The collaboration between Saudi universities, Nobel Prize awardees and eminent scientists is increasing the strategic research partnerships by bringing the world's most prominent scientific minds to the country to promote science and technology. Saudi

Arabia is increasing university-industry-government collaboration.<sup>4</sup> This vision is swiftly shifting Saudi Arabia from an oil based economy into a knowledge-based one.

### Research Reforms

Saudi Arabia understands that the countries which do not invest in research become extremely dependent on others.<sup>11,12</sup> Considering the importance of research, King Abdul Aziz City for Science and Technology (KACST) was established in 1977 to support and promote scientific research and technological activities in the Kingdom. KACST is playing a significant role in enhancing research, especially in medicine, science and the social sciences. KACST is the leading body providing huge funding for research. Saudi scholars are now returning to their parental places from the USA, UK, Canada, Europe, Australia and Japan. The government is wisely spending to set up independent research labs and centres for excellence, encouraging scientists by topping up the salaries of grant-winners and offering incentives for publication in Institute for Scientific Information (ISI)-indexed journals. This has resulted in achieving the 45th position for Saudi Arabia in world ranking.<sup>13</sup> Saudi Arabia produced a total of 161,717 research papers in ISI-indexed journals, and only in year 2014, 22,413 ISI-indexed research papers were published from Saudi Arabia in various scientific disciplines<sup>14</sup> and the country's h-index reached 144<sup>13</sup> (Table-2).

### Patents

Over the last decade, the number of patents has continued to increase and there has been an inspiring increase in the number of patents granted by United States Patent and Trademark Office (USPTO) in 2010. The Kingdom of Saudi Arabia had produced a total of 521 utility patents in 2011, and 245 patents were cited in reputable scientific papers. The total 245 utility patents are distributed in fourteen fields among the sixteen fields matched by the International Patent Classification (IPC). Patents from Saudi Arabia are distributed in bio-medical sciences and analysis (35%), and measurement and control technology (17%). These are the areas in which Saudi academics are actively publishing, and the areas that the Saudi government is investing in through establishing research clusters.<sup>4</sup>

### Technological reforms

Saudi Arabia has been passing through a revolution of technology transformation period to meet the mandate of transforming the country into a knowledge-based innovative economy. The country has aims and ambitions of advancing from the factor-based stage of economic development to the innovation-based stage of economic

development.<sup>3</sup> In addition to developing world-class research universities, collaboration with Nobel Prize awardees, legendary scientists, producing enormous number of research papers, rising h-index, Saudi Arabia has made a strong entry into advanced technology. KACST launched 12 satellites from Baikonur space station, Kazakhstan, with a full-fledged system.<sup>15</sup> King Abdul Aziz University (KAU), Jeddah, made a strong entry into sophisticated Unmanned Aerial Vehicle (UAV) technology, signed an agreement with Tokyo University, Japan, and the British Cranfield University to build drones powered by solar energy.<sup>16</sup> In addition, Saudi Arabia has peaceful nuclear ambitions, is committed to building the King Abdullah City for Atomic and Renewable Energy (KACARE) at a cost of \$140 billion.<sup>16</sup> It will be entirely based on the latest technologies and serve the country's focal point for all research and peaceful activities. It will meet the Kingdom's growing energy needs for water desalination, while decreasing dependence on fossil fuels. KACARE will be the central hub for country's nuclear energy research in different fields, including agriculture, mining and medicine.

## Conclusion

Saudi Arabia is developing world-class universities, technological and research institutes. Collaboration with Nobel Prize awardees and famous scientists has resulted in producing an enormous number of research papers, a rising h-index, advances in space system and a strong entry into UAV technology. Saudi Arabia is turning into a regional hub for advanced education, research, science and technology while swiftly shifting from an oil-based to a knowledge-based economy.

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