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POLICIES ON BUILDING WORLD-CLASS UNIVERSITIES IN SAUDI ARABIA

An Impact Study of King Fahd University of Petroleum & Minerals

INTRODUCTION

The Kingdom of Saudi Arabia's current effort in developing its higher education sector and building world-class universities has drawn international attention. In particular, its higher education reform is aimed at preparing the Kingdom for a future that does not solely depend on its oil resources, and thus strive to assume a key position not only in the Middle East but also the world. With full support from King Abdullah bin Abdulaziz and his government, a range of policies and approaches have been implemented, both at the national and institutional levels, geared to fulfilling these ambitions. Based on this socio-economic context, this chapter provides a review of the current developments and strategies of higher education reform in the Kingdom. More specifically, a case study of King Fahd University of Petroleum & Minerals (KFUPM) is presented to illustrate how these national strategies and policies are being adopted at the institutional level.

THE NATIONAL CONTEXT OF BUILDING WORLD-CLASS UNIVERSITIES

Located between the Arabian Gulf on the east and the Red Sea on the west, the Kingdom of Saudi Arabia is the largest country in the Middle East and it possesses at least 25% the world's oil reserves and is a leader of the international oil industry. Unprecedented economic and social changes have been witnessed over the past forty years. Since the early 1970s, its oil revenues have been utilized to develop its economy, improve social and health standards, and to modernize society (Ministry of Higher Education, 2010a; Al-Mubaraki, 2011).

However, as alluded to above, the government is highly aware that to sustain the nation's development, its future cannot solely depend on its natural resources. This is particularly critical in the context of a global knowledge-based economy, as a nation's sustaining power is increasingly reliant on information, innovation and human capital. To assume a dominant role in the Arab world and to raise its international visibility, the Saudi government believes that higher education will play an indispensable and ever important role in both international cooperation and national competitiveness (Marginson & Van der Wende, 2007). As shown in the *Future Plan for Higher Education in Saudi Arabia*, higher education is designed

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and evaluated in relation to the overall national development plan, and is considered essential for educating a skilled workforce for its socio-economic development, promoting research and development, and for maintaining its distinctive cultural heritage (Ministry of Higher Education, 2010a). Since 2006, and subsequently as a part of *the Future Plan for Higher Education in Saudi Arabia* (AAFAQ), a variety of policies were designed and are being implemented at promoting excellence in the higher education.

Expanding University Capacities

Higher education in Saudi Arabia has undergone rapid growth in the past few years, with the number of students (both male and female) increasing from 444,800 in 2002 to 903,400 in 2010 (Ministry of Economy and Planning, 2011). In 2009, more than 56.6% of enrolled students were female; male students were 43.4% (Ministry of Higher Education, 2010b). With the establishment of 10 new universities during the past few years, the higher education system now includes 24 government universities, 18 primary school teacher's colleges for men, 80 primary school teachers' colleges for women, 37 colleges and institutes for health, 12 technical colleges and 26 private universities and colleges. Moreover, under the governance of the Ministry of Higher Education, these higher education institutions are distributed across almost all of the country's 13 administrative provinces so as to achieve a regional balance in national growth (Saudi Arabian Monetary Agency, 2007; Onsman, 2011).

The Kingdom currently invests heavily in its education, with the education sector representing over 25% of the total budget (more than US$13 billion), within which more than US$2 billion is spent on higher education annually (Ministry of Higher Education, 2010a). In May 2012, His Majesty King Abdullah bin Abdulaziz is to inaugurate the first phase of the University and Education City projects aimed at creating a world-class higher education infrastructure across the country and boosting research capacities. In fact, a total of US$21 billion will be invested in addition to the regular education expenditure (Arab News, 2012).

Study-Abroad Policy

In addition to higher education expansion, the Saudi government has put in place a variety of scholarship programmes, both government- and university-led, aimed at cultivating a high-skilled national workforce to tackle the pressures of global competition. Such scholarship programmes were initiated in the 1970s, when most students were sent to the US, UK and Canada. This study-abroad policy has been reinforced since 2006 as part of the King Abdullah Programme and within less than four years, more than 40,000 students were sent to universities all over the world, with the main focus being on subject areas that can serve to boost the country's economic development, such as engineering, medicine, information technology and sciences. Moreover, King Abdullah Programme is geared toward developing an

internationally competitive workforce and establishing a high calibre base in the domestic universities (Ministry of Higher Education, 2010c).

National Commission for Assessment and Accreditation

To improve the quality of post-secondary education in the Kingdom, the National Commission for Assessment and Accreditation was established, with the responsibility for evaluating universities' academic programmes and curricula against both national and international criteria. The organization not only collaborates with higher education institutions, but also with industry, community agencies, other higher education stakeholders as well as other international quality assurance agencies, so as to ensure its evaluation criteria meet high international standards (National Commission for Assessment and Accreditation, 2010).

THE CASE OF KFUPM

At the institutional level, universities in Saudi Arabia have echoed the government's directives, by implementing different approaches aimed at developing excellence. Among them, KFUPM represents an interesting case, because its exercises have borne fruit in terms of improvements in the quality of education, research and community services. KFUPM, a mainly science and engineering university, was officially established in 1963, and started student admission in 1964, it being a government-supported institution. The vast oil resources of the country pose a complex and exciting challenge for scientific, technical, and management education. To meet this challenge, the university has adopted advanced training and is developing extensive research in the fields of sciences, engineering, and management. Along with other older universities in the Kingdom, KFUPM has a higher status and has better-qualified and more stable staffing. KFUPM graduates are usually preferred by employers of Saudi academics over their counterparts (Onsman, 2011). Since 1970's, the university's enrolment steadily increased and currently there are 8,693 students with a total of 1,702 staff members including both academic and research personnel (Ministry of Higher Education, 2010d). It boasts six colleges (Engineering, Applied Engineering, Sciences, Environmental Sciences, Computer Sciences and Engineering, and Industrial Management), providing both undergraduate and postgraduate level courses.

Strategic Planning Directives and Governance

The Ministry of Higher Education keenly recognized the fact that in their pursuit of enhancing the quality of higher education, leadership was crucial. Consequently, so as to enhance leadership skills, in 2009 the Academic Leadership Centre (ALC) was established to give focus and emphasis to this critical issue. Based on an initial plan, the ALC organized numerous developmental activities serving some of the

needs of Saudi higher education institutions and administrators (Academic Leadership Centre, 2012).

Based on the national policy of strong encouragement for rationalized governance, KFUPM was determined from the beginning that it should strive to achieve global excellence in the shortest possible length of time. When the Ministry of Higher Education launched its initiative in 2006 to prepare a modern and a long term plan for university education, *the Future Plan for Higher Education in Saudi Arabia*, KFUPM was chosen to conduct a detailed study for the preparation of an effective plan to achieve a world-class higher education system in the coming 25 years. The plan includes an analytical review of the current conditions and operations and explores the practical development horizon for Saudi higher education to achieve its strategic objectives, as well as ensuring that Islamic values and Arabic cultural heritage are maintained.

Further, it has devoted serious effort in a systematically planned manner, with consecutive strategic plans being prepared and implemented since 2006. The first established goals in five different aspects of provision for the years 2006-2011: to develop excellence in education (producing quality graduates), to develop excellence in research (conducting innovative research with the main focus being on national needs and international trends), to enhance university standing and reputation, to strengthen competitive edge in response to emerging challenges in society, and to provide services to society and the community (creating stimulating campus life and providing responsive services of value to society (KFUPM, 2006). More specifically, the strategic plans set goals for tackling 24 specific issues ranging from improving student motivation, reducing bureaucracy, building alliances, increasing diversity, setting out the research direction, improving human resource policies with respect to retention, competencies, etc., and improving outreach to the community. Having seen the success of this approach in many areas as well as identifying shortcomings, the university leadership decided to develop a second strategic plan, with a longer time horizon, from 2011 to 2020, focused on the adoption of new ideas and technologies (KFUPM, 2011).

In its pursuit of excellence, the university understands the importance of quality assurance and has implemented institutional policies to promote this, by adopting international standards and criteria. As a result, the Accreditation Board for Engineering and Technology (ABET) in the US has declared that its engineering programmes are "substantially equivalent" to similarly accredited programmes in America. In addition, it has recently been accredited by the National Committee for Assessment and Accreditation along with its programmes in sciences and management by the Association to Advance Collegiate Schools of Business.

Human Capital Development

An important parameter that provides for excellence in educating students is the selection of students and faculty and the university believes that an objective mechanism for admitting students is the basis of achieving this goal. In fact, according to the records, a high proportion of the best science students in the

Kingdom join KFUPM. Regarding this, of the approximately 122,000 science students graduating from senior high schools, about 30,000 apply to the university, but only 3,560 achieve the standard required. However, the number of students eventually joining each year at present is about 1,800.

The university has recently embarked on improving its faculty profile by attracting high-level scientists from all over the world, based on the Ministry's direction. More specifically, different schemes have been created under the titles of joint professors, chair professors, and research chair professors. Faculty under the lattermost category are generally selected from the Highly Cited list provided by Thomson Reuters and the total number of Professors attracted thus far to KFUPM in this category is 24 (12 in 2009 and 12 in 2010). The breakdown of these scientists as per the disciplines is: chemistry (3), computer sciences (2), environment (1), engineering (3), material sciences (6), mathematics (6) and physics (3). Moreover, new tracking indicators have been put in place to identify potential researchers with a proven record for hiring and promotion purposes, which has resulted in an increase in the number of excellent postdoctoral researchers and graduate students, helped by the generous stipend on offer.

In addition to the need for such recruitment strategies, KFUPM leaders firmly believe that developing excellence and improving academic skills for faculty members are among the primary goals of academic institutions, as faculty quality is directly related to improving the learning process and thus learning outcomes. Thus, the university has established the deanship of academic development, with responsibility for the continuous enhancement of the quality of its academic system by ensuring that faculty and teaching assistants reach their full potential in teaching and research. Moreover, in order to encourage faculty development, the Ministry of Higher Education holds open competitions covering the whole country regarding proposals for higher education development, as part of the "Development of Creativity and Excellence of Faculty Members in Saudi Arabia". KFUPM has won four programmes to date, including planning and managing e-learning in higher education, e-learning teaching and learning skills for online education, peer consultants in teaching, and developing tests to assess the quality of higher education outcomes, (KFUPM, 2012a).

Research Development and Innovation

Institutional initiatives have been designed and implemented to enhance research excellence, innovation and technology in KFUPM. At a national level, the Saudi government has funded and encouraged universities to establish centres for research excellence. In line with this policy, the university has set up five centres of excellence in the areas of: nanotechnology, corrosion, renewable energy, Islamic finance, and refining and petrochemicals. It has also implemented various internally funded research initiatives covering grants for fast track research and research funds for junior faculty, to name a few. Moreover, in 2008, the Saudi government put out requests for 67 distinct research projects and invited faculty at the country's universities to submit proposals. In all, 37, or more than half of the

proposals, were awarded to faculty at KFUPM, the nation's smallest university (KFUPM, 2012b).

The university established Dhahran Techno-Valley (DTV), a high-tech park, on campus, in line with the expressed wish of the Higher Education Ministry. To this, it has succeeded in getting many of the world's leading corporations to establish their research and development (R&D) centres there, thus taking advantage of the proximity to the university engineering labs and faculty and the world headquarters of Saudi Aramco, situated adjacent to the campus. Regarding this, Schlumberger, the world's largest oilfield services corporation, has opened a research centre on the site and since has doubled its business with Saudi Aramco. Moreover, Yokogawa, a Japanese technology company, has also built a research facility and plans to double that space. Further, Baker Hughes, a global oilfield service company, has also inaugurated a research facility to collaborate with Saudi Aramco. Finally, over 10 other multinational corporations have long-term lease contracts in university built facilities in the valley. The main goal behind this setup is to encourage industry-academia interaction focusing on core research helpful for addressing local problems.

Meanwhile, in order to realize its community obligations based on national policy, KFUPM has extended its research dimensions to serve the R&D demands of the nation: industrial, business, and governmental sectors. Regarding this, the university's research institute, with its 30-year history and strong reputation in the region, has been building on its accumulated experience, by playing a central role in the success of numerous industrial and environmental initiatives. This has involved drawing on its strong capability for adapting technologies based on the unique service and operating conditions in the Gulf. An interesting development is the formation of Research Cloud, whereby researchers across the Kingdom's premier universities and institution (such as KFUPM itself, King Abdullah University of Science and Technology and King Abdulaziz City for Science and Technology) can collaborate and use each other's resources electronically through a high speed education network – Saudi Arabian Advanced Research and Education Network.

Table 1 shows that the patent profile of KFUPM has increased by leaps and bounds, a feature that can be accredited to the Kingdom's policies and support in promoting excellence in research. In relation to this, from Figure 2 it is clear that the amount of intellectual property generated in the last couple of years is more than that generated in the previous 20 years.

Collaboration with World-Class Institutions

A strong emphasis of the Ministry of Higher Education is to have research and academic collaboration between highly acknowledged international institutions and the Saudi universities. In relation to this, a trilateral collaboration agreement between Saudi Aramco, KFUPM, and Stanford University aimed at establishing a

Table 1. Patent applications

Total non-provisional patent applications filed (1995–to date)	*Current Status*	*Country filed*	*Ownership*
338	215 pending	204 U.S.	189 KFUPM
			3 KFUPM and Saudi Aramco
			12 KFUPM and MIT
		1 each in Japan, Korea, Eurasia and Norway and 2 each in Europe and China	KFUPM and Saudi Arabia
		2 GCC	KFUPM and 1 with Saudi Aramco, 1 with MIT
		1 India	KFUPM and MIT
	21 abandoned	US	KFUPM
	26 allowed	US	KFUPM
	76 patents issued	71 US	67 KFUPM
			3 KFUPM and Saudi Arabia
		5 Japan	1 KFUPM and Petroleum Energy Centre, Japan
		5 Japan	KFUPM and JCCP Japan

Source: KFUPM (2012c)

strategic relationship in education and scientific research in petroleum engineering and geosciences is a good metric of national policy guiding institutional growth. The university also signed a research collaboration agreement with Massachusetts Institute of Technology in June 2008, which will last for a period of over seven years and will involve the conducting of joint research in the areas of: clean energy and design, clean water, and manufacturing and nanotechnology, and working on educational projects. An increase in the patent profiles as a result of such mutual collaborations is one of the key outcomes.

Information Technology as an Enabler

The Kingdom's policy makers realize the importance of information technology as an enabler of advanced learning and research. In keeping with this, one of the notable advances in technology, a scalable High Performance Computing (HPC)

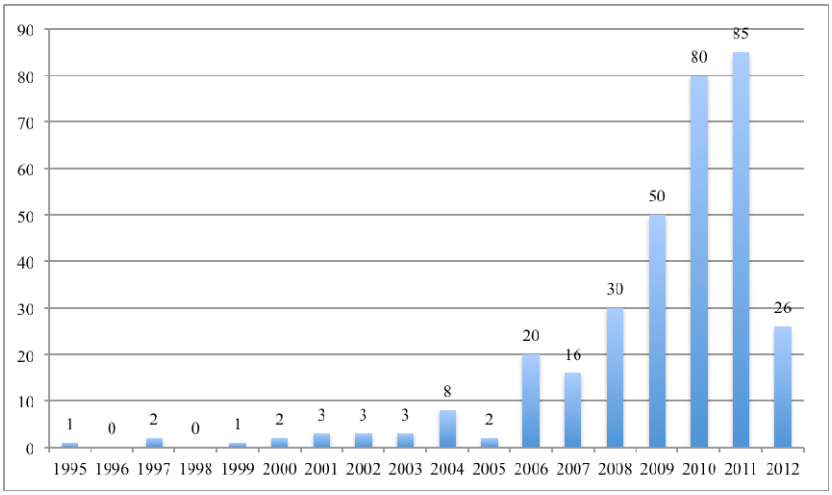

Figure 1. Progress of intellectual property generation at KFUPM, until May 2012. Source: KFUPM (2012c)

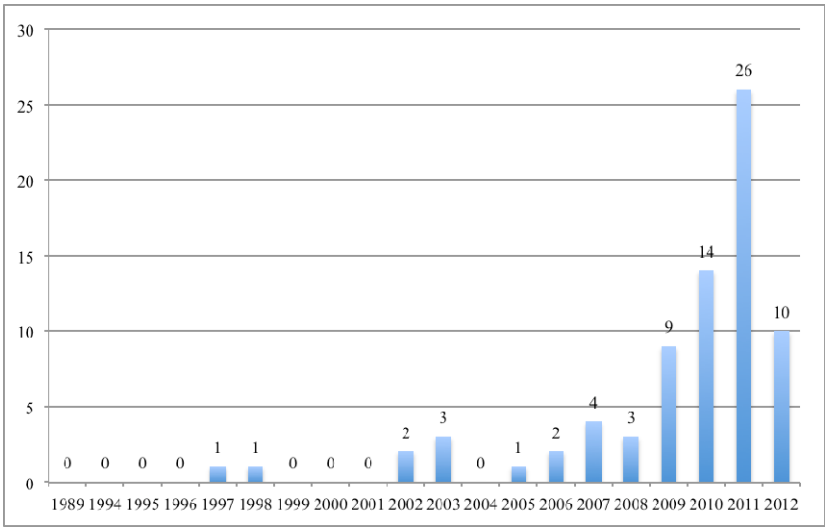

Figure 2. Patents issued during the last 20 years, until May 2012. Source: KFUPM (2012c)

cluster, has been made available to the faculty to improve the effectiveness of advanced research. More specifically, the main benefits to the university in deploying the HPC facility include: increased competitiveness, faster research times and attracting major projects with industry. Furthermore, the e-learning

initiative at KFUPM is providing necessary software, including course management systems and authoring and assessment tools for ensuring successful delivery of university curricula and instruction. Regarding the course management systems, these are a major platform for successful course content delivery, assessment, communication and collaboration through the web. In addition, the university's open access initiative is a key driver of the efforts to ensure that all teaching, research and administrative documents are organized, maintained and made available through the web.

The deployment of two enterprise resource planning systems, the Oracle E-Business Suite and the SunGard Banner Student System, was initiated in 2005 with a big bang approach ensuring that all the aforementioned systems went live at once. Moreover, considerable investment was made in making sure that all the major stakeholders were given training and incentives in relation to operating the new software. Further, shared ownership of the data with proper accountability provided validation for its integration into a single system. In relation to the software, a powerful modelling tool was used to cover 160 main business processes in a 24-week time frame, with the entire as-is/to-be cycle being thus completed. However, a careful balance between customized and packaged processes was maintained to ensure best business practices, while adhering to the constraints necessary in a semi-autonomous institution.

Network connectivity available to students has been extended to cover their rooms and dormitories so as to provide them access to the information highway, seamlessly. Further, network storage space is provided to the community in the form of uninterrupted access to their valuable data. In addition, faculty members have round the clock access to computing resources through the high-speed campus network, *Asymmetric Digital Subscriber Line* (ADSL) home network and the *virtual private network* (VPN) for extranet access. The rise in productivity through this all-encompassing connectivity has been phenomenal. Moreover, students can register for courses online from anywhere, conveniently, thereby saving them the burden of having to be physically present. Further, KFUPM has a high percentage of smart classrooms with Internet connectivity to facilitate learning and teaching. In addition, the availability of a digital library service has served to ease the access to learning and research materials. Finally, a major part of the IT budget goes into training and this has resulted in home-grown project completion, and consequent reduction in the cost of exorbitant consultancies.

CONCLUSION

This chapter has reviewed the Kingdom of Saudi Arabia's education policy drivers in relation to building world-class universities and has also presented the KFUPM case to assess its progress to this end. Various strategies and measures have been adopted and implemented at both the national and institutional levels, in particular, in terms of quality assurance, strategic governance and international collaboration. Further, education and research spending has increased massively throughout the country and one impact arising from this is some of its universities now having

acquired international visibility in the global rankings. For example, KFUPM entered the Quacquarelli Symonds (QS) World University Ranking in 2008 (QS, 2011) and Academic Ranking of World Universities (ARWU) in 2010 (Shanghai Jiao Tong University, 2011) and its position in both have been continuously improving ever since (see Table 2). To a certain extent, we can argue that the Kingdom of Saudi Arabia's experience in developing academic and research excellence has been successful. The Saudi story also shows that without strong government support and effective management, this could not have been possible.

Table 2. KFUPM's performance on the global university rankings

	2003	2004	2005	2006	2007	2008	2009	2010	2011
ARWU	/	/	/	/	/	/	/	401-500	301-400
QS	/	/	/	/	/	338	266	255	221

Source: ARWU(http://www.arwu.org/);QS(http://www.topuniversities.com/institution/king-fahd-university-petroleum-minerals/wur)

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