

Engineering Education in the Arab Gulf States: Stagnation versus Change

W. Akili

Professor of Civil Engineering (retired)

Introduction:

The latter part of the twentieth century has witnessed an unprecedented economic, social, and technological change in many regions of the world. Perhaps, no region has experienced as dramatic a change as the states of the Arab Gulf region, referred to as the Arab Gulf States. These six neighboring states (Saudi Arabia, Bahrain, Kuwait, Qatar, United Arab Emirates and The Sultanate of Oman) share common heritage, history, and language. Oil is the Region's most valuable natural asset and production and revenues have increased dramatically in recent years, most notably since OPEC price rise in 1973.

Great strides since the early 1970s have been made in the provision of human services (health, education, and welfare) and in building infrastructures and urban sprawls, which are comparable in many ways, to those in North America. People's lives have greatly changed in the Region, and modernization and western technologies have found their way to every village, town and city within the six States. The educational arena has also been greatly impacted at all levels. University education has also had its ample share of growth, expansion, and proliferation. Many public universities were established in the Region between 1960 and 1985. Except for Saudi Arabia where the public university system is comprised of several universities, there is today, at least one public university in each of the five other states. When compared to Saudi Arabia, these five States are considerably smaller in area and population.

The focus in this paper is on the colleges of engineering of the Region (Table 1). Eight colleges of engineering were founded through collaboration with institutions abroad, and each one of these colleges is in a university setting. Their declared mission is: to equip the young citizens of the Region with appropriate engineering "know how" and to enable the graduates to share in the technological change that has spread throughout the land.

Most of these eight colleges of engineering have fulfilled their mission admirably during the early period following their establishment. Graduates have occupied responsible positions mostly in government, and to a lesser extent, in the private sector. Some have finished higher degrees abroad and returned to serve as faculty members in their home institutions. A few have climbed the ladder all the way to the top to hold high-ranking positions, and some have become ministers.

However, current indicators show that these eight colleges have not caught up with the modernity that has swept the engineering academic arena. They are “behind the curve” and do exhibit signs of stagnation. Retrenchment, isolation, and inability to regenerate appear to be the symptoms of the malaise that has gripped these colleges.

<i>Country</i>	<i>College of Engineering</i>	<i>Year Established</i>
Saudi Arabia	King Saud University – Riyadh	Early sixties
Saudi Arabia	King Abdul-Aziz University - Jeddah	Early sixties
Saudi Arabia	King Fahd University of Petroleum and Minerals (KFUPM) – Dhahran	Late sixties
Bahrain	University of Bahrain – Manama	Mid seventies
Kuwait	College of Engineering and Petroleum at Kuwait University - Kuwait City	Mid seventies
Qatar	University of Qatar – Doha	Early eighties
United Arab Emirates	UAE University - Al-Ain	Early eighties
Oman	Sultan Qaboos University – Muscat	Mid eighties

Table 1. The Eight Engineering Colleges of the Gulf Region

The euphoria and self pride that had been exhibited at the time of their establishment, and shortly there after, appear to have subsided; and more genuine concerns reflecting the current mood are being openly debated. A wide range of issues have surfaced; included are: (i) the need to restructure present programs and curricula; (ii) the need to introduce organizational changes; (iii) the need to develop long-term connections with neighboring industries; and (iv) the desire to foster proper engineering culture in the classroom and at the workplace.

Contributors to this constructive debate have come from industry, faculty, administration, and students. As a consequence, ideas, directions and preliminary plans have emerged but not yet properly jelled. The debate goes on, and forces of change are in the air. But there are counter arguments and counter measures that would deter, restrain, and prevent change in the foreseeable future. Included here are: (i) the severe budget cuts that have been imposed by most of the governments in the Region, including cuts in the higher education sector; (ii) replacement of well-seasoned expatriate faculty with young inexperienced nationals; and (iii) the current stance of some officials and decision makers who argue against any potential change.

This essay presents some of the issues currently being debated. The main focus here is on academic curricula in the Region and the need to rejuvenate the “early-era” programs and plans.

The paper also opens up the broad and complex subject of college-industry collaboration that has remained dormant and virtually unexplored for the majority of these colleges.

It should be pointed out that the author in this endeavor draws largely on his own personal experience as a previous faculty member in Qatar and earlier in Saudi Arabia. Other sources have come through informal discussions with colleagues, alumni and people from the industry.

Background:

Engineering education in the Arab Middle East had its early start after world war I. Colleges-or schools as they were referred to – were founded early on in Cairo and Alexandria, Egypt; and in Beirut Lebanon. Shortly after World War II, colleges of engineering were established in Iraq, and Syria. ⁽¹⁾

Engineering colleges (schools) in Egypt and Iraq were influenced largely by the British system. The colleges in Lebanon and Syria paralleled the French views in engineering education. The sole exception then, was the Engineering School at the American University of Beirut (AUB). Founded after World War One, AUB was looked after by a consortium comprised of colleges on the East Coast of the USA. ⁽¹⁾

As for the Arab Gulf Region, the renaissance of higher education in general and engineering in particular, began in earnest in the early 1960s when universities were founded in Riyadh and Jeddah, Saudi Arabia. The two colleges of engineering namely, King Saud University in Riyadh, and King Abdul-Aziz University in Jeddah, were largely influenced by the Egyptian model. Engineering faculty then were drawn largely from the Arab Middle East, and to lesser extent from the Indian Subcontinent. Language of instruction was a mix of Arabic and English, where English was used for technical terms only as the worst case scenario. ⁽¹⁾

The most renowned engineering college in Saudi Arabia has been the engineering college at King Fahd University of Petroleum and Minerals (KFUPM). The College (known earlier as the College of Petroleum and Minerals) was founded in Dhahran, Eastern Saudi Arabia in the late 60s. Its mission was to prepare young Saudis for positions in the Saudi oil industry, a vital economic sector controlled largely by Aramco then, or Saudi Aramco today. Over the years, Saudi Aramco has played a major role in supporting KFUPM. Thousands of KFUPM graduates have received training and have found permanent and secure jobs within Saudi Aramco. Since its establishment, KFUPM has pretty much followed the American system, and has maintained relatively high standards. It has been considered the most prestigious of all colleges of engineering in the Region.

In the smaller states of the Gulf Region, other engineering colleges were founded soon after these States gained their independence. The states referred to are: Bahrain, Kuwait, Qatar, United Arab Emirates, and the Sultanate of Oman. Pertinent information is provided in Table 1.

The University of Bahrain College of Engineering in Manama had started in the 60s as a two-year vocational college. The College was transformed in the 70s to a four-year engineering college, and is part of the Bahrain University system. Similarly, the College of Engineering and Petroleum in Kuwait, one of ten colleges that make up the University of Kuwait, came into being in 1975. The College of Engineering in Kuwait has a wide variety of undergraduate programs and has followed the US model. It is interesting to note that over 30% of the student body in the College of Engineering and Petroleum in Kuwait are women. ⁽²⁾

Following the same trend of providing engineering education to their nationals, Qatar and the United Arab Emirates, each had its college of engineering become a reality in the early 1980s. Both colleges were initially set up according to the US model, and have attempted to stay the course with some difficulty. ⁽¹⁾

The last college of engineering to be founded in the Gulf Region was that at Sultan Qaboos University in Muscat, Oman. Founded in 1985, the College was initially set up to follow the North American plan of education but has also been receptive to views of the UK system.

The Region's eight colleges of engineering have a lot in common and appear to be facing similar challenges. All eight colleges are colleges within public universities. They are government run, and government financed. The organizational structure is nearly the same in all. Students are mostly nationals of their respective countries and graduates of similar public education systems. Admission policies (for all eight) are based primarily on grades in high school. The results of a non-standard entrance exam and evidence of proficiency in English (mostly TOEFL) may exempt the applicant from a pre-engineering preparatory year administered as a separate unit from the College. Statistics have shown that over 80% of first year students attend pre-engineering. ⁽¹⁾ The effectiveness of pre-engineering units in preparing students has been under scrutiny. The consensus is that radical changes are required and steps should be taken to modify current programs, teaching methods, and students' assessment schemes.

Although English is unanimously agreed upon as the language of instruction, there are differences of opinion on how much English is necessary. One view is that English should be phased in gradually, thus allowing for Arabic to be used simultaneously with English. The counter view, held by most, is that English proficiency should be acquired and exhibited at the start.

While English is used for engineering subjects by all eight colleges to varying degrees, Arabic is used almost always for non-engineering courses such as mathematics, science, humanities, etc. The only exception to this stance is the setup at KFUPM in Dhahran, Saudi Arabia, where the use of English is not limited to Engineering subjects but rather used throughout the academic program.

Curricula:

The eight colleges of the Region have operated with curricula that were drawn at the time of their establishment, by advisory boards made up of faculty members largely selected from US colleges. The Grinter Report ⁽³⁾ and Goals Report ⁽⁴⁾ were the two benchmarks applied for curricular design at that time. Although some amendments have been introduced to existing curricula, the author is of the opinion that changes have been minor and largely piecemeal. Thus the structure of the old curricula have, for all practical purposes, remained almost intact. Table 2 summarizes the breakdown and credit hours assigned for each category of the existing engineering curricula at the University of Qatar, which is typical of curricula elsewhere in the Region. ⁽⁵⁾

<i>Component</i>	<i>Credit Hours</i>
Pre-Engineering (Intensive English)	One or two semesters of non-credit
Mathematics and Science	30 credit hours
Engineering Core (Fundamentals)	23 credit hours
Departmental (including capstone and project)	65 credit hours
Humanities and Social Sciences (including Arabic, English and Islamic Studies)	20 credit hours
Total	138 credit hours

Table 2. The Engineering Curriculum at the University of Qatar: Major Components and Credit Hours

It is difficult, in the absence of relevant data, to assess how well have the “status quo” engineering curricula in the Region served the interest of graduates, industry and the profession in general. There is a growing recognition that current curricula do need a major overhaul. Forces for this come primarily from within engineering colleges. Some of the concerns and disenchantment that have surfaced include:

- inadequate preparation of students entering first year engineering. English, mathematics, and science have been cited as troubling to a relatively large percentage of students;
- mathematics and science offered during the first and second year are not properly integrated into engineering courses and tend to be largely unrelated to what follows;
- some courses do not seem to be properly sequenced. It appears that streamlining, flowcharting, and interconnecting of course material is necessary;
- there is a need to reduce course content particularly in engineering subjects;

- lectures and labs should be oriented more towards essentials and students should be given the tools to fill in the gaps;
- wider and more effective use of computers should be made as early as possible.
- engineering electives and capstone courses should be practice-orientated;
- sharing ideas and information exchange in and out of the lecture hall through: open forums, debates and discussion groups are currently almost non-existent;
- ways and means of encouraging teamwork and cooperative learning need to be instilled at the very start.

The literature is full of new ideas and plans for curricula reform. The most talked about are: downsizing ⁽⁶⁾, adoption of what is termed a “holistic” curriculum, ⁽⁷⁾ and several scenarios for curricula integration. ⁽⁸⁾ Irrespective of labels and nomenclature used to describe the reform process; the revised curricula must embody the following elements: (i) to correct flaws in old version; (ii) be forward looking; (iii) allow integration of course contents into cohesive units; (iv) stress fundamentals and; (v) focus on the practice.

The author, in principle, argues in favor of adopting the framework of integrated curricula. The scenario proposed by Everett et al ⁽⁸⁾ appears to have produced impressive results that have come about as a consequence of the synergistic effect of four elements deemed necessary in the design of an integrated undergraduate engineering curriculum today. These elements are:

- integration of science and mathematics into problem solving and design;
- an emphasis on teaming and cooperative learning;
- wider use of computers to improve design and problem solving throughout the educational experience; and
- continuous assessment and evaluation of methods and outcomes.

The Integrated Version: Current curricula in the Gulf Region seem to be fragmented, disjointed and carry within their framework a heavy dose of unnecessary information. A properly designed, well-conceived curriculum of the integrated variety can help overcome many of the shortcomings that plague the traditional type. Integration implies making individual courses become integral components of a whole, while at the same time require each course, or component, to be interdependent upon one another, bound by common thread of knowledge. ^(8,9) This interdependence intends to form connections between individual units of knowledge beyond the traditional prerequisites and /or co-requisites. Classes taken during the same semester should interconnect; and knowledge given in a course, during a specific semester, should flow across to other courses given the same semester. The thesis here is that the students would appreciate the material by linking what appear to be disjointed pieces of information rather than the “shotgun” approach embedded in a traditional type curriculum. The salient features in this type of a curriculum are:

- lateral integration between science, mathematics, and fundamental concepts of engineering during the first and second year;

- a common year of engineering science presented to all majors during the second year, covering in an integrated way: mechanics, materials, circuits and electronics, energy and its manifestations, fluid flow and thermodynamics;
- field-specific introductory and follow up courses (for each major) embodying: analysis, design, synthesis, and computer applications; offered largely during third year; and
- electives and capstone courses properly integrated with design project(s) commensurate with students' interests; offered during fourth year.

The specialized, discipline-specific courses, during the latter years, must be designed to connect between the fundamentals provided during the first two years and the practice-orientated body of knowledge deployed by practitioners. ⁽⁸⁾ It is argued that the integration referred to here is primarily horizontal and would take place during the first two years. This model helps build a broad-based interconnected foundation of fundamentals upon which discipline-specific courses are built up vertically.

Many advantages of an integrated curriculum versus traditional one have been cited. On the learning side, they include the following:

- helps motivate students to learn non-engineering subjects such as mathematics and science; since such subjects are intertwined with engineering;
- increases the probability that students will value the material being presented by linking what would otherwise be disjointed pieces of information;
- helps establish increased relevance between the material being studied and student's perception of his career needs; and
- aids in increasing students grasp and retention of new material.

Clearly, a paradigm shift is taking place in the academic arena in which the focus is moving away from faculty and their teaching towards students and their learning.

Other Factors: The advantages of curricular reform based on an integrated model are quite evident as has been discussed. However, to carry out the change and execute intended reform is another matter all together. Let us not forget that if execution is not carried out properly, the intended change may result in unintended consequences that would make matters worse.

The concern here is that the current academic setting in the Gulf Region does not always produce a majority opinion. Although matters of such significance as curricula change are debated openly; final decisions are usually made by the empowered few and often are too little too late. However, the author is cautiously optimistic that favorable change in the decision making process will eventually take place, and vital decisions would be based on consensus opinion arrived at in an open forum.

At the outset, the goals of the curriculum and the qualities desired in graduates have to be identified. Table 3 lists the qualities believed necessary for engineering graduates of the Region.

A summary of the activities/tasks required to impart these qualities is shown in Table 4. To what extent can declared goals be met, depends on implementation. Several specific factors would help create and sustain the culture that drives the integrated curriculum. Many of these factors believed to be present, to some extent, in the Gulf academic environment, may need to be further developed to ensure success. These factors will include:

- teamwork
- faculty involvement
- students contribution
- organizational support
- periodic assessment

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| <ol style="list-style-type: none">1. Sufficient knowledge of fundamentals2. Ability to use mathematics to solve engineering problems3. Ability to solve problems across disciplinary boundaries4. Proficiency with computer software5. Proficiency in oral and written communications6. Ability to learn independently7. Ability to work with peers8. Ability to design in declared areas of competence9. Appreciation of safety, ethics, community concerns, and environmental issues |
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Table 3. Desired Qualities of Engineering Graduates

Teamwork: A key element is appropriate communications between students and faculty to instill: mutual trust, mutual respect and spirit of camaraderie. Teamwork tends to foster constructive attitudes and breaks down traditional barriers between faculty and students. Students as teachers and/or lab assistants works well and helps bridge the gap.

Faculty involvement: The role of faculty is most crucial. The nature of this exercise requires synergies between faculty members within the same department, members of different departments within the college, members from different colleges, and between faculty members in general and students. While there need be only a few champions on the faculty, involvement on lesser levels by others is necessary to ensure continuity and success. Needless to say, ample time is required to help instigate, develop, and sustain the culture for reform. This would apply equally well to faculty members and students.

Students' contributions: Students are the prime beneficiaries of reform. Success and failure of an integrated curriculum hinges on students' attitudes and willingness to cooperate. Informal settings, where students can express their views frankly and clearly are highly encouraged.

Students should open-up to the process, cooperate amongst each other, and provide proper feedback to help make necessary changes when required.

Organizational support: University regulations and bylaws in almost all Gulf universities require approval by the top brass no matter how insignificant the proposed change may be. Before approval, expert opinions are usually solicited. At the University of Qatar, curricula changes are ordinarily referred to the Engineering Advisory Council – made up of faculty members drawn from US universities – to have their say prior to sanctioning and implementation. Implementation could be delayed for as long as a year or two should additional resources and/or extra manpower, not budgeted for, be necessary to carry out the reform.

1. Integrate mathematics, science, and engineering fundamentals properly
2. Bring in the “system” behavior, not only “component” behavior
3. Allow for acquiring analysis and design skills early on
4. Provide for sufficient laboratory and hands-on experience to demonstrate concepts
5. Allow for an early start of individual senior project (design project) in a declared area of competence
6. Provide for some exposure to the practice with emphasis on local experience

Table 4. Activities/Tasks to Impart Desired Qualities in an Engineering Graduate

Academe and Industry:

When universities and industry find common ground to meet each other’s needs, often with the blessing of the government, the mutual benefits can be substantial. It was a logical progression for the colleges of engineering in the Gulf Region to turn towards industries in their locale attempting to build bridges and set up advisory boards. Establishing a working relationship between selected industries and the engineering college, by and large, has proven to be difficult and often short-lived. It takes more than an enthusiastic faculty member acting alone, or a single joint project that has seen daylight, to claim that a long-lasting and beneficial relationship has been achieved.

In North America, academe and industry working together is not new. However, in the Gulf States the situation is very different. Except for oil and oil-related industries, the bulk of the industrial sector in the Region is small size entrepreneurial, and sees no benefits in opening up to the College of Engineering. In all the states of the Region, major industries (oil industry in particular) have maintained some lines of communication with the University in general and the College of Engineering in particular. With one or two exceptions, the industry-college relations

can be described as intermittent, short-term, and does not seem to be rewarding to either side. Who is responsible for the status quo? What would it take to build long lasting mutually beneficial relations? While there are no clear-cut answers, certain factors appear to have contributed to the state of despair that tend to exist today. These factors include:

- lack of interest (to the extent of indifference) on the part of most industries to get involved with engineering institutions;
- clear differences between the two cultures, that of industry versus academe;
- inability of the College to market its services and products;
- reliance of most industries on expert opinion from abroad, thus reducing potential collaboration with the College;
- the prevailing misconception that expatriate faculty should not be allowed to consult or engage in after hours activities; and
- the petty attitude of intermediaries (civil servants, administrators) hinders collaborative effort and often adversely affects the outcome of a joint venture.

On the bright side, the industries of the region have responded well to students' training and cooperative education programs. All present curricula require successful completion of either an eight-week training period or two consecutive semesters of cooperative education. The major industry players in these domains are oil and gas companies, chemical and steel companies, building and road contractors, electric utility companies, some government agencies, and smaller engineering service firms. Despite some setbacks, misjudgments and unpleasant outcome experienced by some, the vast majority of students has positive impressions and believes that the training or co-op period is time well spent.

Proposed Measures: Forging long-lasting relationships with industry is a quest that colleges of engineering in the Region should embrace and work hard to achieve. As faculty members, we cannot be professionally satisfied with teaching only. Today, with the engineering profession undergoing dramatic changes on many fronts – there is need to be involved with real problems and to share in providing solutions. We owe it to our students to prepare them to meet the challenge ahead by focusing on real issues derived from tangible situations. Drawing materials out of textbooks is not enough – we need to bring our own contributions to the classroom! Therefore, we need to communicate with industries around us and genuinely attempt to understand their point of view. Therefore, constructive measures have to be taken to rectify the current stalemate and turn things around. The measures referred to are:

- (i) introduce sweeping changes to current regulations and bylaws to reduce red tape that impedes the process. These changes have to be recommended by the University administration and mandated by the Government;
- (ii) encourage faculty members (expats and nationals alike) to reach out to the industrial sector to cultivate meaningful contacts and develop (one on one) connection with their counterparts;
- (iii) setup advisory boards to facilitate collaborative efforts and to provide logistical support to collaborators; and
- (iv) restructure programs, redefine mission, and provide resources to meet industry's needs.

The most probable areas for such collaborative ventures in the foreseeable future are:

- short-term, stop-gap consultation and professional advice by experienced well-seasoned faculty;
- longer term joint research studies aimed at resolving chronic problems of industry and help find longer lasting solutions;
- help the industry in setting up appropriate analysis and design methods, and help develop standards and relevant testing methods.

The author is of the opinion that the initial hurdle is to get started. Faculty and staff members with industrial experience are ideally positioned to play a major part at the start of a collaborative joint venture. Their insight and experience would help greatly in defining the mission and chartering an appropriate course of action.

Contrary to what some entrepreneurs in the Region believe, joint participation need not be for philanthropic reasons; nor should it be undertaken to gain favors, improve company's image, or win government approval. These ventures can, and thus should, provide real benefits for all involved. Industry can benefit by gaining access to university facilities and its human resources. Also, by receiving the services and products that faculty and staff generate. In turn, joint collaboration can provide the College with additional revenue and access to industrial equipment and setups not available on campus. Successful ventures also help overcome the complaints about engineering education: lack of hands-on experience, not enough teamwork, and textbook problems rather than real-world application. Students' involvement in such collaborative efforts can boost their self-confidence and help in improving their communication skills. Joint undertaking could provide professional development to faculty members as well, by exposing them to practical situations and relevant technologies. As an added benefit, and when conditions are right, project data and outcome may get published, thus enhancing faculty members list of publication.

Some Encouraging Results: Although the overall impression portrayed here, on collaboration of engineering colleges and surrounding industries of the Region has not been positive to say the least; there are nevertheless some success stories that deserve to be reported.

During the late seventies, the Research Institute of King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia was founded. Housed on campus, with its own skeleton staff and facilities; it began to reach out to potential partners (industry and government) with a well-defined mission. Despite some setbacks in the beginning, the Institute became fully operative within a few years. It has been rendering services to participating industries and Government agencies in the domains of: economic modeling, oil and gas technologies, water resources management, environmental impact studies, characterization and testing of materials, and setting up new standards.⁽¹⁰⁾

In the author's opinion, the Research Institute of Dhahran, Saudi Arabia is a success story by all measures. Factors contributing to its success have included:

- its well-defined mission and appropriate organizational structure;
- its proper administrative setup with staff that can relate to industry, thus help foster collaboration; and
- having campus as home-base has helped provide easy access to university vast resources.

Perhaps additional factors that may have come to play in the case of KFUPM Research Institute, is its unique position with, and close proximity to, Saudi Aramco, the largest oil producer in the Middle East. KFUPM has always enjoyed the tremendous support provided by Saudi Aramco since its establishment.

Discussion:

Even though the journey of these Colleges, since their establishment, has been relatively short, the experience gained in the process provides valuable ammunition in chartering their future course. Each college must make choices, develop plans, and adopt strategies to lift itself out of its current state of stagnation.

First, each college must win the approval and the support of the government to secure appropriate funds. The funding picture is getting blurrier as operation budgets at all levels are being trimmed and resources are dwindling. The days when colleges could not spend their sizable budget, no matter how hard they tried, are gone forever. The tuition-free enrollment enjoyed by nationals of the State may soon be over. Thus the realities are setting in requiring vigilance when decisions are made. Against this backdrop of budget cuts and dwindling resources, the Colleges of Engineering have to move swiftly to reorganize, set their priorities and develop appropriate plans. This way they will help reduce inefficiencies and eliminate waste.

Second, the time has come for these colleges to become more self-reliant and thus less dependent on out of country manpower. This implies that nationals should acquire the experience and training necessary before assuming positions of leadership. At the present time, opportunities for professional development for young faculty members returning home with higher degrees are almost non-existent. Explicit mechanisms to encourage young engineering professors to keep up with the practice ought to be found. It is also necessary to train young faculty in the interpersonal, teamwork, and leadership skills. Having more trained leaders in the wings should bolster the pool of potential deans and department heads.

Third, pre-university preparation of engineering students has always been a central issue. The College should not lose sight of the fact that learning is a continuum; and what engineering students had learned during their schooling years (elementary, intermediate, high school) will have a lasting effect on their grasp, retention, appreciation, etc. A wide gap appears to exist between pre-university level education and the desired level for students entering engineering.

To bridge the gap, colleges of engineering in the Region have instituted a one-year of preparation, which in the author's opinion has fallen short of fulfilling its objectives. This bridging year, largely devoted to learning English skills, should also be utilized to foster proper learning habits. Simply stated, the methodology and habits of learning acquired early on are non-conducive to meaningful learning. The engineering prep year should contain a necessary component that addresses learning reform.

Fourth, the image and professional traits of the engineer at the workplace and in society at large are rather "fuzzy" and ill defined. Who is the engineer? What qualities and skills does he possess? What is engineering? These questions are often improperly answered. In the author's opinion, the Colleges have not addressed these issues properly. The current paucity of literature on matters related to engineering ethics, moral values, social issues, community concerns, etc. have not been properly addressed in existing curricula nor adequately dealt with in the classroom. There is need to sketch out the contours of the profession, provide the literature, and begin to foster appropriate culture wherever possible. Unfortunately, in the absence of engineering societies in most Gulf States, the burden lies on the Engineering Colleges to fill the vacuum. Other issues that need to be addressed are: (i) setting standards for the practice; (ii) licensing; (iii) promoting the engineering profession in schools; and (iv) protecting the profession and professionals from swindlers, intruders and carpetbaggers.

Summary:

Engineering colleges in the Arab Gulf States (Saudi Arabia, Kuwait, Bahrain, Qatar, United Arab Emirates, and Oman) – established in the sixties, seventies and early eighties, and modeled after North American and British colleges, are currently experiencing a downturn. The current stagnation that has beset these institutions has manifested itself in retrenchment, downsizing, isolation, and inability to regenerate.

Although most of these colleges appear to have served the Gulf Region rather well early on, they are at a junction that requires needed change in vision, mission, commitment and organizational structure. This invariably implies allocation of resources, availability of well-seasoned faculty and the setting up of a flexible and adaptive system that responds to the changing needs of engineering professionals in the Region.

The essay focuses mainly on two issues: curricula reform and college-industry relationships. With regard to the first, sweeping changes must be made to the "early-era" curricula. It is argued that "integrated" curricula would have tangible advantages, as it provides a more appropriate framework for meaningful learning, integration of knowledge, proper exposure to design and practice, and motivation to learn mathematics and science.

Secondly, the essay dwells on the current stance of college-industry relationships in the Region. It argues that meaningful, long-lasting relationships have not been properly cultivated, and calls

for initiating and sustaining collaborative schemes and mutually beneficial ventures; thus requiring the College to make proper moves in this regard.

Finally, the essay points out that the image of the engineer in the Gulf society is “blurry”, and argues for the need to foster appropriate engineering culture in the classroom and at the workplace.

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Biography:

WADDAH AKILI

Dr. Akili has been in the academic arena for 35 years. He has held academic positions at Drexel University, Philadelphia, Pennsylvania (66-69), at King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia (69-87), and at The University of Qatar, Doha, Qatar (87-00). Professor Akili’s major field is geotechnical engineering and engineering materials. He is interested in contemporary issues of engineering education in the Middle East.