



THE ADVOCACY OF ESTABLISHING A GCC ENGINEERING ACCREDITATION BOARD

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ABSTRACT

Many Engineering programs in GCC countries are increasingly seeking international recognition through accreditation of their programs by leading accreditation bodies such as the US Accreditation Board for Engineering and Technology (ABET). In fact out of ten universities with engineering programs internationally recognized by ABET, three engineering colleges in GCC countries have earned the ABET "Substantial Equivalency" status for several of their engineering programs. While this is quite an achievement and a recognition of the efforts devoted by GCC countries in higher education, the authors of this paper are advocating an alternative modality for seeking even wider recognition through the establishment of a regional accreditation board. The GCC accreditation board will have the authority to review and accredit engineering and technology programs in GCC countries, and can select an avenue to gain the mutual recognition of other international accreditation agencies.

This paper reviews the current accreditation practices in GCC countries as well as the strong wave of reforms in engineering education taking place internationally, specifically in developed countries, in an attempt to advocate the establishment of a regional engineering accreditation board that serves as a quality assurance system for all engineering programs in GCC countries.

Keywords: ABET, Accreditation, Education, Engineering, GCC

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1. INTRODUCTION

With the ever-rising cost of higher education, especially in technical fields such as engineering, the need of an effective accreditation system today is more justified than ever. Well-known universities in the world that in the past have relied on the quality associated with their well-established record are now actively seeking accreditation of their engineering programs. This change of attitude towards accreditation has materialized as competition has intensified with many new forms of educational institutions claiming to offer cost-effective degrees in a variety of creative ways. In the fields of engineering, the rapid technological development of the past decade has brought with it many new educational entities claiming to offer engineering degrees in disciplines that are sometimes loosely linked to engineering. A reliable accreditation system has become a necessity for the following reasons:

1. Accountability of the institution to offering and maintaining quality higher education
2. Confidence of parents and employers that graduates of a program are well prepared to practice the profession
3. Acceptance of the graduates pursuing advanced degrees (graduate programs) at other institutions
4. Mobility and competitiveness of the graduates in seeking jobs at regional and multi-national corporations
5. Facilitating transferability of credits as students move to other institutions

Today, students and their parents simply believe they have the right to know whether an institution provides quality educational programs. Accreditation is also important to governments that finance the educational system as well as parents that pay the cost of education either directly as tuition and fees or indirectly through the government funding of universities. Recently, however, and with the rapid renewal of knowledge and technology, accreditation has become even more important as a quality assurance tool that ensures graduates are well equipped to practice engineering and be productive in their careers.

Engineering programs in GCC countries are increasingly seeking international recognition through accreditation of their programs by leading accreditation bodies such as the US Accreditation Board for Engineering and Technology (ABET). In fact out of ten universities with engineering programs internationally recognized by ABET, three engineering colleges in GCC countries have earned the ABET's "Substantial Equivalency" status for several of their engineering programs. While this is quite an achievement and a recognition to the efforts devoted by GCC countries in higher education, the authors of this paper are advocating an alternative modality for seeking an even wider recognition through the establishment of an internationally recognized GCC accreditation board.

This paper reviews the current accreditation practices in GCC countries as well as the strong wave of reforms in engineering education taking place in developed countries in an attempt to advocate the establishment of a regional engineering accreditation board that serves as a quality assurance system for all engineering programs in GCC countries.

2. CURRENT GCC ACCREDITATION PRACTICES

Examining the state of engineering education and the requirements of professional engineering practice in GCC countries, as compared with those of developed countries, the following major items stand as in need of great attention and development:

- A system of engineering accreditation that is recognized locally, regionally, and internationally.
- A standardized engineering examination at the entry (start practice) and professional (consultant) levels. This exam can be considered as an engineering registration and licensing for practice in GCC countries. It can also be used as an independent monitoring system of the quality of engineering programs and their graduates.
- Expanding and strengthening the national engineering societies so that they can play a significant role in advising the engineering educational institutions as well as supporting the profession.

All GCC countries have universities offering engineering programs, with Saudi Arabia and United Arab Emirates having several universities offering a variety of engineering programs. Licensure and monitoring of these programs are mostly done at the level of the ministry of higher education in each country. During the last decade, some GCC engineering programs in Kuwait, Saudi Arabia, and the United Arab Emirates have sought and obtained the "Substantial Equivalency" status by the US Accreditation Board of Engineering and Technology. The main reason for seeking international accreditation is to ensure the quality and the continuous improvement of the engineering and technology programs, which are so

vitaly important to the development of this region. However, additional pressures have brought other factors where accreditation helps the graduates of an internationally recognized program with mobility at a wider-scale in seeking jobs and pursuing graduate degrees.

One attempt at establishing a national accreditation system is progressing fairly well in the United Arab Emirates (UAE). The UAE ministry of higher education and scientific research has recently established a commission for academic accreditation that has the responsibility of licensing all UAE academic institutions as well as accreditation of all academic programs according to a set of published criteria [UAE Standards for Licensure, 2001]. The UAE accreditation criteria are in principle similar to the international criteria [EAC-ABET, 2001], and the process of accreditation involves several steps that can be summarized as follows:

- Prior to offering a new degree program, the institution must send the commission a comprehensive proposal written in accordance with the Commission's guidelines.
- The Commission invites experts in the field of the program, mostly from the US and UK, and schedule a 4-day visit to examine the readiness of the institution to offer the proposed program. A positive review results in granting the program the status of accreditation-eligible.
- Upon graduation of the first class of students, a program can apply for full accreditation. The process involves submitting complete program documentation and a comprehensive on-site review by experts in the field.
- A positive review results in granting the program the status of accreditation for 5 years.

The UAE Commission for Academic Accreditation can be viewed as a positive step in establishing a national accreditation system. Additional steps are necessary to gain an international recognition that facilitates transfer of students as well as acceptance of degrees for graduate studies. These steps will be discussed following a review of recent developments in international accreditation and trends in engineering education.

3. ENGINEERING ACCREDITATION IN DEVELOPED COUNTRIES

The longest history of engineering accreditation by an independent professional body exists in the United States. Started as the Engineers' Council for Professional Development (ECPD) in 1933, today the Accreditation Board for Engineering and Technology (ABET) is the sole agency recognized by the US Department of Education as a responsible board for accreditation of engineering and technology programs in the US. ABET is strongly influenced by professional engineering societies that incorporate the interests of the profession and the public. In 1991 ABET established the International Activity Committee (INTAC) that became responsible for review of engineering programs outside the US. ABET has reviewed and granted "Substantial Equivalency" evaluation to 74 programs at 15 institutions in

10 countries. Among these countries are Kuwait, Saudi Arabia, Turkey and the United Arab Emirates.

ABET has developed several mechanisms for international cooperation. These include memorandum of understanding with 7 international accreditation bodies (including Mexico, UNESCO, Japan, Germany, etc.), mutual recognition agreements with the Canadian Engineering Accreditation Board, and has entered the Washington Accord in 1989 with 8 other countries, including Australia, Canada, UK, Japan, Ireland, and New Zealand. The memorandum of understanding is a good first step towards mutual recognition and perhaps joining the Washington Accord, which provides the following for the signatories:

- Signatories recognize the substantial equivalency of engineering programs in satisfying the academic requirements for the practice of engineering at the professional level
- The criteria, policies, and procedures used by the signatories in accrediting engineering academic programs are comparable
- The accreditation decisions rendered by one signatory are acceptable to the other signatories

ABET is supportive of expanding these agreements as it cannot possibly accommodate the demand to accredit an increasing number of engineering and technology programs worldwide.

European countries, aside from France and the United Kingdom, have recently started to focus on the need for an accreditation system that would facilitate mobility of students and graduated engineers. The Bologna declaration in 1999 and subsequent meeting in Prague in 2001 of European ministers of higher education have brought together 32 countries in an effort to put a common framework for European higher education. It is surprising to know that countries such as Germany, Austria, and the Netherlands have just recently started to introduce a system of accreditation for their engineering programs [Hedberg, 2001] in an effort to attract more foreign students and talent. While differences exist among various European educational systems, there is a high degree of similarity between the various European engineering education systems. There are many explanations for this similarity:

- The international character of modern industry and of the engineering profession
- The influence of multinational companies recruiting in many countries
- The cross-border movement of academic staff

In Germany, a recent decisive reform in the traditional German system of higher education [Fuchs, 2001] has led to the formation of the accreditation agency for study programs in engineering and informatics (ASII) in August 1999. This reform was mainly driven by the need to improve employment opportunities for German graduates in the global market as well

as to attract more foreign students into engineering programs. Even though Germany is among few nations that still offer cost-free higher education, engineering schools have struggled to attract foreign students, less than 10% of all students are foreign. With the stated goal of doubling the foreign students enrollment, the reformed educational system has opened the opportunity to complete undergraduate and graduate engineering degrees in English, and it has eased considerably the transfer of credits to facilitate student mobility.

The Japan accreditation board for engineering education (JABEE) was established in late 1999 as a non-governmental organization. In 2000, JABEE piloted accreditation of 20 programs using examiners from academia and industry in cooperation with ABET [Ohnaka, 2001]. JABEE has entered the Washington Accord in 2001 as a provisional member, and has therefore modified its accreditation policies and criteria to be outcome-based and comparable with other signatories of the Accord.

The previously cited reforms of accreditation practices in developed countries have common trends that will be examined in the next section.

4. INTERNATIONAL ACCREDITATION TRENDS

Convergence of engineering accreditation criteria is evident today as many countries are influenced by the globalization of engineering as a profession. The focus is now placed on mobility of engineers and on implementing a set of criteria aimed at achieving mutual recognition for the cross border practice of engineering. In fact, a strong international initiative being addressed at the Hong Kong Working Group as well as at the Asia Pacific Economic Cooperation (APEC) focuses on the need of facilitating the mobility of persons and information for human resources development [ABET- INTAC, 2001].

Emphasis is still strong on the core criteria regarding students, faculty, facilities, institutional support, and financial resources. However, as a result of making Program Criteria less rigid, drastic changes have taken place, and great attention is now being placed on the following three areas [References 2-7]:

1. Program Educational Objectives- Institutions and programs define mission and objectives to meet the needs of their constituents, thus enabling program differentiation. Along with this newly given latitude, the program is responsible for establishing a system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to continuously improve the effectiveness of the program.

2. Program Outcomes and Assessment- Outcomes are defined as statements that describe what students are expected to know and are able to do by the time of graduation.

A set of measurable outcomes that have become more or less conventional are part of ABET's criterion 3 [EAC-ABET, 2001], which states that engineering programs must demonstrate that their graduates have:

- An ability to apply knowledge of mathematics, science and engineering appropriate to the discipline
- An ability to design and conduct experiments, analyze and interpret data
- An ability to design a system, component, or process to meet desired needs
- An ability to function on multi-disciplinary teams
- An ability to identify, formulate, and solve engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
- The broad education necessary to understand the impact of engineering solutions in a societal context
- A recognition of the need for, and an ability to engage in life-long learning
- A knowledge of contemporary issues
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Programs are required to use effective assessment measures to demonstrate that each student achieves the program outcomes before certification for graduation.

3. Professional Component- Preparation for engineering practice. Aside from setting the major educational components (science, math, engineering, and humanities), this criterion includes the need for a culminating major design experience, based on knowledge and skills acquired in earlier coursework. Such experience must incorporate engineering standards and realistic constraints, including considerations such as economic, ethical, environmental, health and safety, sustainability, social, and product manufacturability.

The change that has taken place in the engineering accreditation requirements can then be viewed as a shift from input-based to outcome-based criteria, i.e., from an educator-delivered to a student-learned and/or experienced. While this shift has been debated and discussed very extensively over the past few years, there are still major difficulties experienced by many engineering programs in effectively following the new set of criteria and applying the necessary assessment measures that ensure compliance with them. Many educators, however, agree that in pursuit of quality education, it is a reliable approach to examine the outcome of

the educational process as a way to evaluate and continuously improve the input into the process.

5. ADVOCACY FOR A GCC ACCREDITATION BOARD

GCC countries, among other Arab countries, have a better chance of establishing a regional accreditation board because of the following reasons:

- The presence of a general cooperation framework, namely the Gulf Cooperation Council
- Government support of higher education is strong
- Engineering programs at GCC universities fit to a great extent into the international model
- Most engineering faculty at GCC universities are educated in the US and Western Europe

Added to the above is the strong demand for high quality engineers to support the engineering needs of the fast developments witnessed in GCC countries. Public awareness of the significance of accreditation is also more evident in GCC countries than in most other Arab countries where educational opportunities are limited. Moreover, GCC countries are experiencing an increasing number of educational startups at various scales, and an effective accreditation system is needed to help the public and governments to realize the value of the many available educational opportunities.

With the opportunity of obtaining the “Substantial Equivalency” by ABET for GCC engineering programs, the obvious question becomes: *Why establish a regional accreditation board?*

In addition to providing a quality assurance system of engineering programs, there are many significant reasons for having an autonomous regional engineering accreditation board that is a partner of an international accord, including:

1. A much wider recognition of GCC engineering students and graduates not only in the US, but also in Europe, Japan, and the rest of the developed world. This will give GCC students and graduates greater access to educational and job opportunities.

2. Faculty and university administrators in GCC countries will have an input into the accreditation system that is followed by their programs and institutions. This will allow GCC universities to preserve the cultural elements in the general education component of an engineering degree.
3. Engineering faculty can become program evaluators not only in their country of employment, but also in other GCC countries. This will provide tremendous opportunities to learn and spread best practices as well as to avoid pitfalls of other programs.
4. Reduce duplication of efforts- where programs have to follow separate, and sometimes conflicting, set of criteria to obtain national as well as ABET accreditation. This represents a burden and a challenge to program faculty and administrators, and consumes valuable resources.
5. Cost-effectiveness associated with a regional review versus an ABET review.

The authors are advocating a regional engineering accreditation board that is built following the converging standards of international engineering accreditation. As discussed previously, the UAE national Commission for Academic Accreditation can be considered a first step in this direction, but the commission is responsible for all academic programs. A regional board or agency focusing on engineering and technology programs is needed to facilitate international recognition. The following steps are envisioned as essential for the establishment of a GCC engineering accreditation board:

- A. Developing the framework of the regional board and the mechanisms of implementing accreditation of engineering programs.
- B. Developing the accreditation criteria along with an effective mechanism for continuous review and enhancement of these criteria in keeping with international trends.
- C. Once functioning, the board may sign a memorandum of understanding with ABET as a first step towards international recognition. This will promote cooperation and will lead to [ABET website, 2001]:
 - Facilitate the exchange of representatives to observe accreditation activities
 - Collaborate in the development of workshops and training for evaluators and faculty
 - Exchange information about best practices in promoting quality assurance
 - Explore the feasibility of mutual recognition based on the collaboration, exchange and assessment of respective accreditation systems

- D. Seeking mutual recognition agreements with leading accreditation agencies, or alternatively becoming a signatory to the Washington Accord that includes countries such as Australia, Canada, UK, Japan, Ireland, New Zealand, and the United States. In fact ABET has long advocated its preference to mutual recognition agreements as it cannot possibly accommodate the demand to accredit an increasing number of engineering and technology programs worldwide.

The key to start implementing the above steps is to have senior university administrators work together with responsible parties in the GCC Ministries of Higher Education to promote the establishment of the accreditation board. It is not the intent of the authors to suggest a particular model and administrative structure for the proposed accreditation board. The authors prefer to generate strong interest in the idea of establishing the board and recommend a team be formed to develop a detailed proposal that can be discussed at the level of GCC Ministries of Higher Education. It is worthy to note that that ABET can help in the development and formation of the proposed board and it has helped other countries set up their accreditation systems.

It may take a few years of hard work to reach an internationally recognized GCC accreditation board, but it is gratifying to learn that we are not far behind the European and Japanese drive towards the same goal.

6. SUMMARY

The necessity of an engineering accreditation system can be explained as follows:

- The practice of engineering is becoming ever more complex and requiring many skills that must be delivered by well-qualified engineering educational programs
- As higher education become much more popularized and requiring increased state funding, quality assurance provided by accreditation of educational programs is viewed as a statement of accountability
- The current globalized era of the engineering profession requires a system that guarantees international equivalency.

The main reason for seeking international accreditation is to ensure the quality and continuous improvement of GCC engineering and technology programs, which are so vitally important to the development of this region. However, additional pressures have brought other factors where accreditation helps the graduates of an internationally recognized program with mobility in seeking jobs and pursuing graduate degrees. In this regard, the authors are advocating that a GCC accreditation board that is recognized internationally will have a great impact in three ways:

- Reduce duplication of efforts- where programs have to follow separate, and sometimes conflicting, set of criteria to obtain national and international accreditation. This represents a burden and a challenge to program faculty and administrators, and consumes valuable resources.
- Facilitate mobility of students and graduates in terms of transfer of credits, pursuit of graduate degrees and job opportunities.
- Increase the cooperation among programs and universities in the region

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