AC 2007-776: EVALUATION OF INTERNATIONAL ACCREDITATION ACHIEVEMENTS AND SHORTCOMINGS FOR ENGINEERING AND TECHNOLOGY PROGRAMS AND THEIR ECONOMIC AND SOCIAL IMPACTS.

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Evaluation of International Accreditation Achievements and Shortcomings for Engineering and Technology Programs and Their Economic and Social Impacts.

Abstract

Globalization of corporate economics is not just a passing phenomenon but becoming the norm. World economy has become vastly more interdependent as work and job move rapidly and frequently from one country to another. Globalization, especially in the information technology (IT), automotive and manufacturing industries has already begun to change the way engineers work. Modern engineers must possess cross-cultural communication skills, team management skills, and the ability to perform on geographically distributed team. Today's strong believe is that the recent engineering and technology graduates can expect to work at some point of their careers, on teams with members from varied culture and linguistic background. As the stake is very high, it will be rewarding to develop a technically literate work force with international exposure in order to maintain the technological leadership of the United States. This paper contributes towards the understanding of achievements and shortcomings of international accreditation to date.

ABET's EC 2000 criteria has stressed the importance of international experience, awareness of global issues, cultural diversity awareness as desirable traits of new-hire engineers. Substantial equivalency of ABET applies to international accreditation systems and recognizes the subsequent equivalency of the two systems with respect to the preparation of the graduates to begin professional practices at the entry level. The author has found out that enough concentration has not been given to Indian subcontinent countries which normally supply a considerable amount of undergraduate and graduate students to the universities of the United States. This paper will point out the benefits USA will get if we can bring these countries under the umbrella of international accreditation. Companies which are out sourcing jobs to those countries are paying the price for not having the international accreditation in their curriculum. The end result will provide a mutual recognition between ABET and the accreditation boards of those countries who are still not an active participant in the international accreditation process. It will definitely have a positive and long lasting impact on the overall health of the economy and the society.

Introduction

High quality engineering and technology education is a necessary requirement for developing countries to enhance their human, institutional and infrastructure capacity. Improvement in the quality of engineering and technology graduates is considered as a major indigenous technological base upon which economic growth in the world can be achieved. As a result, a base of competent technical workforce will facilitate the investment of foreign capital through the multinational companies. The qualified engineers and technologists not only utilize the foreign aid funds effectively towards infrastructure projects but also start up small businesses[1].

Globalization dictates the graduate engineers and technologists to practice in venues other than the one in which they were educated and initially licensed. Employers are also concerned about the need for understanding and recognizing the competence of engineers from all over the world. Accreditation which provides the primary bases for mutual recognition across national boarder is increasingly seen as an appropriate mean of enhancing the quality of engineering education[2]. Although the accreditation bodies of several countries have made significant progress towards harmonizing their accreditation systems and process, most of the Indian subcontinent countries-are not an active participant in this activity[3].

United States is attracting more and more of world's smartest people. As a result twenty percent of our IT (Information Technology) workers are foreign born and fifty percent of them are on H1B visa. In recent years almost sixty percent of the continuously increasing H1B visas are filled up by the qualified engineers and technologists from Indian subcontinent countries. For the last several years the US Government had no choice but to keep on increasing working visas for importing engineers and technologists from overseas to deal with the severe shortage. In 1995, 65000 visas were granted while that amount has been increased to 215000 by the year 1999. Even though that number has come back to 65000 again, clearly we are relaying on foreign-born engineers[4].

If passed, the Comprehensive Immigration Reform Act, S'2611, would allow high skill foreign born computer and engineering workers to admit into the United States in the next one, two, five, and ten years. The Bureau of Labor Statistics projects an increase of 125% in the computing and engineering work force (C&E) in 20 years. In this process 1.9 million foreign born computer and engineering workers could be admitted through employment based visas[5].

The whole idea is to obtain the highest benefit of mobility of engineers across the globe. There are still several barriers implementing these ideas such as language, ethnical, standard, and local engineering, standards/codes, etc. A quality assurance system such as peer review based accreditation must be needed to promote such high quality education programs and to overcome the obstacles.

At the same time large multinational companies like Microsoft, Intel, Cisco, AOL etc, have kept on investing several billions of dollars in the Indian subcontinent countries. The goal is to increase the profit margin. But they are paying the price for not getting a technological competent work force there. Even though there is a 5% job loss in the U.S. market, ultimately it will bring more capital back here for the companies as well as the consumers. As the control is always with the U.S. companies, well qualified and trained graduates can also be transferred there to recover the job loss is the United Sates.

The reasons for limited participation in international programs offered by several universities and colleges include rigid curriculum and demanding courses, financial implications connected with a longer time to degree completion, and difficulty convincing faculty to accept transfer technical credits from international institutions[6]. In this situation the author thinks that we should explore international accreditation process in the Indian subcontinent countries.

ABET's Role

ABET's role is pivotal in helping the educational programs around the world to be of a caliber demanded by industry, the consumer of graduates as well as the engineering and technology academic community. My concentration is restricted to Indian subcontinent countries for the reasons mentioned above. There is a need to ensure consistence of engineering services across international borders without sacrificing quality. ABET criteria and processes for accreditation are highly regarded internationally by academic institutions and agencies for accreditation[7]. ABET's international initiatives contribute to raising the level of confidence in the integrity of national engineering accreditation systems. ABET is focusing on answering the equality of engineering and technology education through program evaluations, technical assistants, and mutual recognition agreements. ABET list of accredited programs is widely accepted by employers, academic institutions, professional engineering societies, and the professional engineer license board.

ABET does not accredit programs outside the United States. However, ABET looks for substantial equivalency in programs outside the US by institutional request and make recommendation for program improvements. Substantial equivalency means that the program is comparable in content and educational experience but may differ in format or method of delivery. At least it implies reasonable confidence that the program has prepared its graduates for entry level professional employment. Mutual recognition agreements are formed so that the graduates from recognized programs are afforded the same rights and privileges as those graduates in the home country. ABET arranges international workshops for international participants only. This type of workshops focus on presentation and interactive exercises to prepare faculty to develop an awareness and understanding of outcomes based accreditation. In most of the US areas, graduation from an ABET accredited engineering program or equivalent background is usually the first-stage requirement for licensing and registration.

International agreements on engineering education and practice based upon engineering accreditation have been developed since 1979. ABET made an agreement with CEAB (Canadian Engineering Accreditation Board) establishing full reciprocity for engineering graduates between ABET and CAEB which is still valid. It is based upon essentially identical accreditation systems and extensive reciprocal visits between them. As this agreement worked very well, ABET developed a much broader agreement known as Washington Accord among several English speaking centuries such as the United States, Canada, Australia, Iceland, the United Kingdom, and New Zealand. Substantially equivalent approach is taken which means that each accreditation system has policies and procedures in place to ensure educational quality. But it does not mean identical format and method of delivery in either systems or educational experience. The agreement is subject to renewal in every six years even though the signatories assure themselves of continuing quality of the accreditation systems through observer verification visits and exchanges of information[3]. In order to avoid confusion the ABET Board of directors formed a committee (INTAC) rather than an accreditation commission which is used for accreditation programs.

So far INTAC (International Activities Committees) has evaluated sixty-four programs offered by several institutions in Columbia, Iceland, Korea, Kuwait, Mexico, Saudi Arabia, Netherlands,

and Turkey since 1989[7]. According to the recommendation of a task force in 1994, ABET formalized the concept of 'Substantial Equivalency' and strengthened its policies as procedures governing international evaluation. Since 1995 the substantial equivalency has been granted to and institution for a specific term, usually three to six years. ABET policy in terms of paying for this process is that the 'Substantially Equivalent' evaluation process is self-sustaining financially from fees charged from the concerned institute[8]. After having substantial equivalency the King Abdul Aziz University (KAAU) of Saudi Arabia in 2003 has taken several strategic initiatives that will position KAAU to be a leader in Engineering education in the Middle East. It has increased the job potential of its graduates in the local and international markets. Graduates who desire higher education in their fields can easily seek admissions in other international institutions preferably in the United States. As it is a continuous overall improvement process, KAAU will be able to keep its engineering programs up-to date with international standards[9]. Last year the current US administration had issued visas to several thousand students from Saudi Arabia to get undergraduate education in engineering and technology in the United States. The Saudi Arabian government awarded each student with up to $32000 per year scholarship. This flow of capital will even increase when the students will come for masters and Ph. D. programs.

As you can see that this process has not been implemented in the developing Southeast Asian countries such as India, Pakistan and Bangladesh. All the three countries have been maintaining a growth rate of more than 5% for the last several years. Indian economy has more than doubled its size since 1991and it is one of the fastest growing markets for American exports. A sustaining growth of middle class who likes durable goods supports it. Technical education has a direct impact on industrial growth. It is considered as a basic input for national development, industrial expansion and economical growth. Technical education provides the human resources for the successful economic growth of any country. Technological progress and economic development are interdependent. Now the country needs to produce a world-class adaptive workforce for this century and beyond. The first growing process of the internationalization of technical education must have an impact on the country's economic growth. It is important how a country can adopt and shape its higher and technical education systems to address an economic strategy. Financing higher and technical education is the main problem in most of these developing countries. In comparison to Japan which has expended 4.7% of its GNP, India, Pakistan and Bangladesh has expended 3.8%, 2.7% and 2.3% respectively in 1994-1995 in engineering and technology education[10]. Even though the percentage has increased in all three countries with time they still need help from UNESCO, World Bank, Asia Bank and other non government organizations (NGOs). Good news is that in 2003 USA joined the UNESCO (United Nation Economic Social and Cultural Organization) after an absence of eighteen years with additional funds. According to the US government a significant portion of the increased funds must be allocated to enhance the engineering and technology programs of the developing countries in order to promote technical capacity building[11].

IEEE's Role

Participation in the accreditation process of engineering and technology programs is a major responsibility of the IEEE. The IEEE is the largest member society of the ABET's 28 engineering, professional and technical societies and is responsible for more than 700 engineering and engineering technology programs through ABET. The IEEE Education

Activities Board (EAB) is responsible for carrying out the domestic as well as international accreditation activities. It motivates the qualified professionals from industry, governments and academic sectors to serve as program evaluators to contribute towards the achievement of high quality educational standards of engineering and technology programs[12].

The lack of standards for evaluating engineering and technology programs present a grave challenge to the quality of engineers and technologists in countries like India and China. According to Moshe Kam, the vice president of IEEE educational activities, it is a big problem as India is experiencing a shortage of qualified technical personnel in spite of 60,000 out of work engineers among 200,000 annually produced. Protab Bhanu, the president of India's Center for policy research and a member of the National Knowledge Commission expressed his frustration on the production of many unemployable engineers in India. Bhanu and many high tech recruiters blames the India's main accreditation body for engineering education which they consider to be meaningless. In February 2006, IEEE Board of Directors approved Kam's plan to increase the IEEE's influence on the activities of existing accreditation bodies to assist IEEE members in creating accreditation bodies mostly outside the United States. IEEE will develop and disseminate institute guidelines for accreditation of degree guideline programs in its principal fields of interest. IEEE will also create a comprehensive data base of existing accrediting bodies and the program they recognize. The IEEE will also assist in expanding existing mutual recognition agreements between accrediting bodies of different countries. The plan to create and maintain a web protocol to provide information on national and international accreditation will definitely help IEEE sections and members who require help with setting up accrediting bodies and educating local decision makers about the subject [13]. In 2006, IEEE members living outside the United States has become more than half and the number of registered Indian members nearly doubled from about 1500 to 2900[6]. So the Indian subcontinent countries can surely be benefited more.

The author agrees with Kam that the above mentioned agreements will foster increased mobility of professionals and create more efficient and flexible job markets. IEEE must conduct extensive accreditation workshops to the local IEEE members, educators and decision makers of the Indian subcontinent countries presenting the different approaches used by existing accreditation bodies of engineering and technology programs. The newly trained attendees will either construct new accreditation bodies or at least provide assistance to the existing bodies. There are several problems with these processes which depend on foreign evaluators who have differences in language, culture and volume. The goal should be to assist the countries in developing their own independent accrediting bodies after the substantial equivalency or accreditation visits by foreign organizations.

Conclusion

Globalization of engineering and technology program is an important goal for universities and colleges around the world. Global accreditation of engineering and technology program should be the way of future. Today's engineers and technologists must have appreciation for a global perspective. Companies agree that global competency is an important attribute of new graduates in many fields including engineering and technology. Engineering and technology education in the U.S. is among the best in the world and ABET has established the standards that helped make

it so. This is why, the ABET criteria and processes for accreditation are highly regarded intenationally by academic institutions and agencies for accreditation. This paper has gathered evidence in this area. It will be a great gift to the world if ABET shares this expertise. The engineering schools should be encouraged to add a course in their curricula to improve the global cross-cultural communication skills of their students. The author has pointed out the realization of the concerned authorities of producing unemployable engineers and technologists due to the lack of international accreditation. Also the established phenomenon in the United States of having advantage in case of higher studies and jobs for getting degrees from the accredited universities and colleges, must be spread over to the Indian subcontinent countries. The mutual benefits of substantial equivalency in that part of the world is discussed here. A high percentage of engineers and technologists from that part of the world has chosen the United States as their newly adaptive home and has continued to serve this country to bring an enormous technological development to this society. This trend will surely be continued in the future. This substantial equivalency process will also bring some positive impacts on outsourcing U.S. companies in terms of saving cost from extensive training provided to incompetent engineers and technologists in that part of the world. The financial burden is another drawback to the success of the whole process. The paper has pointed out the UNESCO funds for substantial equivalency process as one of the available solutions for the developing countries to sustain economic and social development and poverty eradication. The author also thinks that the Indian subcontinent countries with experience the same empowerment of their curriculum as by KAAU which will bring prosperity for USA and those countries.

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Biography

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