

“ACCREDITATION OF ENGINEERING PROGRAMS IN THE USA”

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ABSTRACT

Accreditation is a way of assessing the quality of education. In the United States accreditation of engineering programs is carried out by volunteers, engineering educators and practitioners who evaluate programs against criteria developed by the profession. Universities voluntarily submit their engineering programs for professional accreditation. The process is supported by various professional engineering societies, the universities that request accreditation, the volunteers who carry out the process, and their employers. The employers consider the investment of time by their engineers as volunteers to be an important responsibility which helps assure the quality of incoming generations of professionals.

This paper summarizes the history of the engineering accreditation process and describes ABET (The Accreditation Board for Engineering and Technology), a federation of professional engineering societies which is responsible for the quality of engineering education. Included are a careful description of a “typical” accreditation review cycle, which requires about 18 months. The key events of this cycle are a self-study by the institution requesting accreditation, a visit to the university by an ad hoc team of engineers, the preparation of reports and the acceptance of the reports by the universities, and finally, the vote of the responsible ABET commission on whether or not to grant accreditation.

There are six general criteria for accreditation – the faculty and its qualifications, the students – their quality and preparation, the quality of the administrative leadership, the commitment of the institution to the program, the fiscal and physical resources devoted to the program, and, finally, the educational plan or curriculum. Accreditation is granted to a program only if its characteristics meet or exceed all of the published criteria. Accreditation is granted to specific programs, e.g., electrical or mechanical engineering, not to an entire university or college. Accreditation is limited to a maximum period of six years.

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In the paper, attention is given to the way in which ABET releases information, and the impact that the profession, through ABET, has had on engineering education in the USA. The perception of ABET by the universities is discussed. Some attention is given to relations with the Canadian Engineering Accreditation Board. Finally, the interaction between ABET and the U.S. government is described, and the implications of accreditation for the licensing of engineers in the USA is mentioned. In a second paper, to be submitted later, possibilities for extending the process internationally will be examined.

ABET - THE ORGANIZATION

In 1982, the Accreditation Board for Engineering and Technology (ABET) celebrated its fiftieth anniversary of service to engineering education in the USA [1]. ABET, founded in 1932, was known as the Engineers' Council for Professional Development (ECPD) until 1979, when it was renamed. ABET is charged with the responsibility of "...developing the better educated and qualified engineer, engineering technologist and others engaged in engineering and engineering-related work..." As one of the means to fulfill this responsibility, ABET conducts accreditation of engineering, engineering technology programs and related programs in the USA. The focus of this paper will be the role ABET has in engineering education today.

As practiced in the USA, accreditation is a process of comparing the characteristics of an educational program with widely publicized and accepted criteria [2]. The programs that are deemed to meet or exceed the criteria are accredited for a limited period. Those that do not meet the criteria either lose accreditation, or are denied it. The notion of criteria implies that certain minimum specifications must be met, and thus the accreditation process does not lend itself to quality ranking. A process of this type must have wide support among both the accreditees and the profession, and ABET enjoys this support.

ABET is a federation of 26 engineering societies in the USA with an interest in education [2]. It is the largest engineering unity organization in the country. The member societies range in size from more than 250,000 to less than 10,000 members as well as the federation of the professional licensing/registration boards. Financial support is proportionally divided among the member societies using a formula which includes the total number of accredited programs in

engineering and engineering technology. Approximately 40% of the ABET budget is supplied by that assessment to the member societies. The programs to be visited for accreditation each year supply another 40%, which is used to defray the direct expenses of the visits. The remaining 20% is obtained by contracts for projects undertaken by ABET.

The Board of Directors, which is the governing body, has approximately 28 members, and society delegations vary in size from one to three based on the number of curricula for which they are responsible as well as their individual membership. ABET derives its authority to accredit engineering programs from the engineering professionals represented by the member societies and from the Council On Postsecondary Accreditation (COPA), a higher education body formed by major educational organizations. COPA is charged with recognizing acceptable accrediting bodies for the universities and colleges it represents. The federal government also has a recognition process which is handled by the U.S. Department of Education. ABET is recognized by the government and by COPA as having responsibility for the entire spectrum of engineering, which includes engineering, engineering technology and related disciplines. ABET is not, however, a government organization, but fully responsible to government for its actions.

ABET carries out its activities largely through volunteer engineers who are selected by their peers from industry, government employ, practice and the academic world. The status of each visitor as a peer and as an expert in the discipline is certified by her/his professional society. A small professional staff in New York is responsible for the administrative operations.

ACCREDITATION – A VOLUNTARY, VOLUNTEER PROCESS

The idea of using volunteers is crucial to the way ABET operates. The engineers who do the work effectively donate their time to the process. Participating in ABET accreditation as a volunteer is a way of honoring and repaying the profession by the professional. It is also a means for contributing to setting and maintaining the educational standards that will lead to preparing new entrants to the profession. The volunteers are reimbursed for their out-of-pocket expenses, but they receive no honorarium. In turn, their employers support their activity by usually releasing them from on-going responsibilities and by providing support

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functions such as secretarial assistance. Thus, the employers, whether industrial or academic, have an investment in the activity, and an interest in making it effective. Industrial concerns benefit from a knowledge of the accreditation process as well as the assurance that their prospective employees are receiving an adequate education. Academic volunteers gain an understanding of the way other institutions solve problems, and thus can contribute to improve their own institutions. They also can help their own institutions prepare for their next accreditation visit. Graduate programs can rely on graduates from ABET accredited programs as having completed a qualified program. Government and foundations use the accredited status of a program as one of the eligibility bases for grants.

From the viewpoint of the accreditees, the volunteer process is important. Accreditation is voluntary, i.e., accreditees are not obligated to request accreditation but do so of their own free will. A consequence of this fact is that in requesting accreditation the accreditees seek an objective evaluation from an engineer who has no real or apparent conflict of interest, but who does have the support of the entire profession to represent that profession. The details will be described in the next section - **there are substantial safeguards to prevent a person from unilaterally imposing extreme personal views.**

THE ACCREDITATION CYCLE

Accreditation is granted for periods of either three or six years. If a university sees that its program in, say, electrical engineering, will expire on September 30, 1990, and if it wishes to have the accreditation extended past that date, it will make a request through its Chief Executive Officer to ABET in January of 1989. This request sets the cycle in motion. For a new program, the events are virtually identical.

ABET responds by sending the university material for an extensive selfevaluation based on criteria existing at that time. This evaluation, which is written, is composed of an analysis of the faculty and its qualifications, the students, the administrative leadership devoted to the program, the physical and fiscal resources, and, finally, the educational plan, or curriculum. A typical self-study will be twenty-five pages long, and in addition will include a one-page resume for each faculty member and a comprehensive outline of each course.

This self-evaluation is submitted to ABET by June 1, 1989. Thus, its preparation requires about three months. A self-evaluation is submitted for each program for which accreditation is desired. A comprehensive self study is also prepared for the college as a whole including the supporting non engineering departments. Shortly thereafter, ABET assigns an accreditation team leader, who is a member of one of the operating arms of ABET. In the case of engineering, this is called the Engineering Accreditation Commission (EAC). The team leader (also a volunteer) studies the self-evaluation during the summer, negotiates with the dean of engineering to set visit dates, resolves questions, etc., and assembles a team of engineers (program evaluators) to visit the university.

This visiting team includes the leader and one person for each program to be evaluated. At times a visitor in training accompanies the specialist as an observer. The program is designed to only utilize trained persons as evaluators. Thus, team sizes vary from two to nearly twenty engineers. A visit is scheduled in the autumn, between September and December (1989). Each visitor has, in advance, a copy of the self evaluation and other pertinent data, including, if available, the most recent past visit report. A survey of averages per region of all pertinent items that may be useful for comparison purposes, e.g. faculty/student ratio, is done from all the self studies for each year and given to the team leaders prior to the visit.

The visit itself requires two days. The visitors visit the relevant departments, while the leader visits the dean and other administrative leaders. Team visitors are also assigned to look at support departments such as physics, English and mathematics. The visitors interview faculty and students, look at student work, evaluate facilities and equipment, and work very hard to gain an understanding of the strengths and weaknesses of the program. The entire team works late each evening to compare findings, and to develop preliminary opinions as to what accreditation action should be recommended.

Late on the second day, the entire team assembles with the university president and other persons as the president wishes, usually including the dean, and makes an oral report of its findings. It is inevitable that such a report concentrates on weaknesses rather than strengths, but an attempt is made to keep it balanced. However, the team recommendations are not revealed at this "exit interview." After the exit interview, the team members depart, exhausted, but usually with a feeling of accomplishment. But, more work remains.

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The team members prepare comprehensive reports of their findings. These are typically twenty to thirty pages long. The principal part of this report is for the use of the commission only. There is also a report that will eventually be sent to the university. Essentially it is a written version of what was said at the exit interview. The complete reports are sent to the team leader.

The team leader then assembles the individual reports into a single report, adding evaluations of the findings at the administrative level. Further, the leader "rewrites" the sections written for the university into a consistent style. The leader then sends all the material to an EAC colleague, who is an officer of the commission, a member of the Executive Committee and who has had a minimum of 3-5 years experience in the process as well as the experience of a minimum of 3 visits as a team leader. This person reviews all the data, and "edits" that part of the report that will be sent to the university. This is done to ensure that it is the profession speaking, not individuals.

Next, the EAC chairperson reviews all the material, and makes additional changes that seem appropriate. The report is then sent to the university over the signature of the EAC chairperson. The university is asked to accept the report and/or to indicate portions of the report that contain errors of fact, though not of opinion. The university may inject new information into the system, but the EAC is not obligated to consider it. At this point, prospective accreditation actions are not revealed, however a notation is inserted indicating programs that are not accreditable based on the information at hand.

By this time, it is probably March or April, 1990. The reports are further modified and collected, and all EAC members (who each year lead themselves two teams) meet in June, 1990, to review the year's work. Each team leader describes the visits chaired, the findings, and the university's response, and then makes a recommendation on accreditation for each program. EAC colleagues ask good, penetrating questions, the strength and weakness of each program is measured against the criteria and finally a vote is taken with regard to accreditation. This entire process takes about five days, for there will have been some 350 visits to programs at as many as 90 institutions by the 45 EAC members.

If, in the judgement of the EAC, a program's characteristics meet or exceed all criteria, accreditation or reaccreditation for six years is voted, and accreditation is continued until 1996. If there are some deficiencies, EAC may

choose to accredit for three years. If the deficiencies are perceived to be more serious, EAC may deny accreditation for a new program, or start the process to terminate accreditation of an existing program. Actual termination requires a second visit. The university receives notification of the action in July, 1990, about eighteen months after its initial request. It is quite common that the different engineering programs in a single university receive different accreditation actions.

If, during the period of accreditation, a program has substantial changes, ABET undertakes a review of those changes. Under certain conditions ABET will call for a special visit to ascertain continued compliance with the criteria.

THE EFFECT OF ABET

ABET publishes, annually, a list of accredited programs [2]. The periods of accreditation are not published, and the universities are asked not to release them. The lists are of interest to secondary school students, to prospective employers, to directors of graduate programs, and to the agencies of the various states that are responsible for licensing (registration) of engineers. (In the USA, the professional societies are not directly involved in registration or chartering of engineers.) Many engineering societies require graduation from an accredited program for qualifying to the higher member grades. All states expect applicants for registration to be graduates of ABET accredited programs. (There are special provisions for graduates of nonaccredited programs which usually involve an extended period of internship before the candidate can qualify for the first part of the registration examination.) Some government controlled programs require accreditation as a prerequisite for qualifying for government assistance.

In Canada, the Canadian Engineering Accreditation Board (CEAB) performs a role similar to that of ABET. Until the CEAB was established, ABET performed the accreditation function for the Institute of Engineers of Canada. Once the CEAB was established ABET stopped its activity in Canada. ABET and CEAB have long enjoyed a close working relationship, and regularly send observers to each other's meetings. A consequence of this is a formal agreement between CEAB and ABET to recognize the results of each other's accreditation actions as being equivalent.

In general, the universities want the evaluation and advice that ABET provides. They move to try to correct the deficiencies that ABET observes. More importantly, they try not to let the problems arise.

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ABET has several characteristics that allow it to maintain the respect of the universities. The criteria are written so that ABET evaluates results, not processes. ABET does not force all universities to act in the same way, but allows for innovation to meet local needs, student characteristics, and abilities and interests of individual faculty members. ABET encourages innovation, asking that the universities show that their techniques and results meet the needs of the profession. The proof of compliance with the intent of the criteria is placed on the university. ABET does not prescribe how to comply.

ABET is not a static organization, but is a slowly evolving one. When it perceives that change is needed, it suggests ideas, circulates them widely, and responds to the feedback that it invariably gets. Precipitous changes would not be tolerated by the universities or by the profession.

ABET has been responsive to the needs of the entire profession and of the entire country, and has generally resisted the efforts of particular groups to effect changes that would cause great concern and on the whole would not benefit the service the profession gives the public. It has, however, considered all ideas sent to it.

ABET, through its unique process, is able to discover potential problems before they have an opportunity to develop. Thus, ABET was the first to discover what developed into the so called crisis in the quality of engineering education which is occurring in the USA, starting in 1979-80.

ABET has initiated a call for most of the national studies in engineering education. However, to keep itself away from possible allegations of conflicts of interest it usually requests that the studies be carried out by other agencies.

SUMMARY

ABET is a creature of the engineering profession. Among its major functions it has developed and promulgated criteria for accrediting engineering programs in the USA. It has earned the respect of the profession, the universities, the government, and the public. It is a voluntary and volunteer process that has worked well for fifty-seven years. The program is stronger than ever.

EXTENSION

It is proposed to submit a follow-up paper that will consider possibilities for extending the process internationally.

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