



## Opinion: Engineering Program Accreditation- Where Have We Been and Where Should We Go?

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### ABSTRACT

We examine the soundness of the idea and practice of engineering accreditation and look critically at the process as implemented in regions around the world. Based on our analysis of the effectiveness of current approaches, we suggest areas and methods for improvement and propose guidelines for a revised accreditation framework that addresses some of the challenges of the current system. In addition to providing standardization of course topics and methods for assessing outcomes and curriculum improvement, accreditation requirements could be adjusted to reduce the reporting burden and recognize the need for faculty empowerment and freedom to innovate in motivating and encouraging high quality educational programs.

**Key words:** Accreditation, Engineering program, Engineering education

### INTRODUCTION

Accreditation is “a process by which an institution...formally evaluates its educational activities, in whole or in part, and seeks an independent judgement that it substantially achieves its own objectives and is generally equal in quality to comparable institutions.” Its origins date back to the late 1700s in the U.S. (Harclerod, 1980). The practice of accreditation for engineering programs and programs in other disciplines has since spread around the world.



Our purpose is to reaffirm the soundness of the idea of accreditation and its benefits while looking critically at the process as currently implemented in some systems around the world and identifying potential improvements. We start with a discussion of the role and value of engineering accreditation and the strengths of the current ABET accreditation process. We suggest areas for improvement and propose guidelines for a revised accreditation framework that addresses some of the challenges of the current system. While different national boards may have somewhat varying criteria, signatories to the Washington Accord International Engineering Alliance have criteria that are consistent with each other and hence with ABET, allowing these countries to have mutual recognition of their accredited degrees (Washington Accord, 2014).

### **PURPOSE AND IMPORTANCE OF ACCREDITATION**

The philosophical basis for accreditation is to ensure that the needs of stakeholders including students and others are met. Institutions of higher education serve an important social purpose in preparing young people to work productively in industry and make positive contributions to society. Institutions are naturally accountable to students, their parents and families, employers, government institutions that provide oversight and financial support, and to society in general.

Accreditation attempts to ensure a certain level of quality in terms of content being taught and the impact of a program on its students. The benefits of accreditation include more uniform quality among degree programs, a way for students and other stakeholders to recognize quality programs, consistency in the body of knowledge taught in the discipline, a means to identify and improve substandard programs, and a process for ongoing improvement for accredited programs. Naturally, institutions around the world take the process seriously.

### **STRENGTHS OF THE CURRENT APPROACH**

There are two basic approaches to accreditation. One is to verify that resources are adequate and classes cover a reasonable body of material. The other is to let the program define itself based on the needs of stakeholders and to provide a process for improvement at meeting the goals of the program.

ABET's EC2000 revision was an attempt to shift from the former to the latter. The revised accreditation standard adopted by ABET in 1996 is based on the premise, possibly derived from management theory, that every program defines its educational objectives, sets out a path to work towards them based on desired student learning outcomes, and measures to what extent the goals were reached at the end of the process. Thus EC2000 imposes a process-based approach to program improvement.



A significant positive aspect of the process is that it encourages departments to engage in 'deeper thoughts' (Uziak *et al.*, 2014) about what they want students to accomplish after graduation and to consider ways to move towards those goals. These goals can provide a useful framework for the creation, delivery and improvement of the curricular structure, course content, and assessment methods.

Many assessments required by EC2000 are quite valuable. For example, 'alumni and employer surveys, open and honest input from seniors at exit interviews,' and feedback from external advisory boards can significantly motivate faculty to improve curriculum and educational activities (Warnick 2012). These assessments are generally qualitative in nature.

### **LIMITATIONS OF THE CURRENT CRITERIA**

Across the educational world there is fundamental tension between empowering teachers and requiring accountability. To a motivated teacher, the institution provides resources and a framework, then steps out of the way to let the teacher create powerful learning experiences for students. To the institution, dealing with many faculty with different skill and motivation levels and approaches, a way to ensure quality throughout the student experience is needed.

National governing bodies and other stakeholders rely on accreditation with the hope that it ensures that schools under their purview achieve a basic standard for educational quality. How can we have a process that requires accountability for educational programs but still empowers faculty to do what they do best?

There is likely no perfect approach or final answer to this fundamental dichotomy. The challenge of balancing autonomy and accountability provides a creative space in which many ideas and potential improvements can be explored.

In this spirit, we identify four challenges presented by the current approach to accreditation. These critiques apply to lesser or greater degrees in various countries where different cultural norms may influence the way that accreditation requirements are applied and enforced.

#### **Documentation Requirements**

Current approaches to accreditation require large amounts of documentation in the required format, thus requiring a 'purely administrative process' with the risk of becoming a 'pencil drill' (Uziak *et al.*, 2014). A recent and excellent white paper by the National Accreditation and Assessment Council, India, points out that the "documentation exercise is too intensive and overwhelming" (Patwardhan and Mohanan, 2022). Paperwork is required for the initial evaluation and for later revalidation visits. Evaluators request more documentation than could be realistically read by a small



team in a few days' time. Programs create more paperwork by an order of magnitude than evaluators can review, often with the intention of playing it safe. An administratively heavy process may inhibit the passion and depth of thought needed to creatively improve a program. This may be for many faculty the most significant issue with the current accreditation criteria (Uziak *et al.*, 2014).

If a program is found to be substandard, the resulting implications for faculty ("stick", rather than "carrot"), may not inspire real improvement. It may be possible to 'make cosmetic changes in the course descriptions,' or in assessments, 'to adjust an existing program to conform to the accreditation framework' (Uziak *et al.*, 2014) or to create massive documentation that appears to satisfy the requirements, while the actual impact of the program on students may be weak.

By a similar argument, 'the accreditation of a program is not, in itself, a guarantee that the spirit intended by accreditation bodies is captured and implemented in the program' (Uziak *et al.*, 2014). Rather than a paperwork exercise, what is wanted is a carefully crafted accreditation system that encourages and rewards educational excellence.

### **Assessment of Outcomes**

Accreditation systems generally include a prescription for assessing student learning outcomes. While this reflects a positive shift in educational leadership from content delivery to student learning, the methods currently employed to this end present several challenges.

In practice, outcome assessment methods inspired by accreditation requirements can be 'contrived and artificial' and at variance with the actual methods used by competent faculty to effect course improvements (Warnick 2012). While the methods give rise to possible temptation to produce large amounts of data and analysis, they fail to inspire the consideration of the meaning of the assessment results. Once the numbers are processed and viewed at a distance from individual courses, faculty members sometimes perceive the gathered data as providing little useful information. As Donna Riley (2012) observes, continuous improvement "does not, over years, accumulate to create systemic change, but instead busies faculty in cycles of...mid-management processes."

The time-intensive administrative requirements required in some regions of the world may have the side effect of overburdening and demotivating faculty. In the worst scenario, young teachers who joined the profession out of passion might observe activities done more to satisfy accreditation requirements than to lift and benefit students. This may not be in the long term interests of academic institutions and hence society. Healthy maintenance of the accreditation regimes in place around the world could include a periodic, critical big-picture look at the burden and impact of outcomes assessment.

Learning connects with deep aspects of the human spirit and will always involve intangible factors. Universities, not being 'enterprises with a defined product,' cannot strictly be run by 'standardized processes.' Universities 'generate a wide diversity of outputs. In research, they create new



possibilities; in teaching, they shape new people' (Boulton and Lucas, 2008). Since 'the consequences of the encounter between minds, between a mind, a problem and evidence, and between the minds of successive different generations are profoundly and marvelously unpredictable,' any quantitative analysis of outcomes is inherently incomplete. As stated in (Patwardhan and Mohanan, 2022), "neither the learning process nor its outcome in the mind is directly observable, so all that we can do is arrive at inferences or informed guesses based on the available evidence. These include the observable behavior of the students in the classroom, what they produce as assignments, projects, or answers to tests and exams, their self-reports on their learning, student feedback surveys, faculty surveys, and so on." Thus the attainment of educational outcomes can only be inferred, and not directly assessed.

### **Credit Hour Constraints**

The present accreditation criteria commonly used in most countries, being a hybrid of process improvement and topical standardization, normally impose credit hour requirements for specific course topics. The hybrid approach may be justified by observing that a program must be identified as a particular flavor of engineering discipline before it can be evaluated by a given accrediting body. As accreditation shifted towards a process-based approach, it may have been philosophically cleaner to abandon specific course topic requirements and allow each program to identify its objectives and construct its curriculum accordingly with minimal external constraints.

Considering the increasing emphasis on broad-based, holistic education (National Education Policy, India, 2020), it would be desirable for universities to have more flexibility in course design. The Chemical Engineering departments of Caltech and Stanford have decided not to pursue accreditation, as they perceived little benefit from ABET requirements. Concluding that ABET was "blocking our students from getting the best possible education," Caltech did this to "allow our students some flexibility in designing programs that will take them down the paths they plan to pursue." Stanford's decision was based on the thinking that accreditation was neither "making our program better" nor was "worth the cost and effort." Both these institutions also noted about inconsistent evaluator feedback. Interestingly, MIT's chemical engineering department is "designing a curriculum at the vanguard of chemical engineering without regard to how it might influence the program's ABET accreditation" (Arnaud, 2017).

### **Variations Among Institutions and Regions**

Standardized accreditation requirements on the surface suggest that accredited programs are equivalent in content and 'output' quality. In reality, there is a wide variation in aptitude and abilities among engineering graduates across institutions and regions.



Given the generally accepted notion that ‘external forces are needed to promote change in higher education,’ the challenge for accrediting agencies and universities, is to determine ‘how external assessment and accreditation activities should best combine with the natural, internal motivations of university faculty to create true excellence’ (Warnick, 2012). How can accreditation be made more meaningful to the programs and faculty tasked with implementing the process? We now attempt to propose some guidelines to this end.

### **IMPROVING THE ACCREDITATION PROCESS**

There may be a tradeoff between processes designed to ensure educational quality and the flexibility that enables rapid innovation and agility in adopting new teaching techniques and curricular topics. It is the authors’ experience that ‘most significant program improvements’ are often done by ‘inspired faculty who review courses and curriculum on their own, and without external motivation’ (Warnick 2012). An outstanding faculty committed to the discipline needs the flexibility to adjust the curriculum and create new courses, and modify existing ones, without a heavy administrative burden imposed by accreditation process.

Teaching at its best requires inspired faculty whose work cannot be fully measured in terms of numbers. Education has to go beyond “skills and information” to “*educating the mind*, which involves understanding and capacity building, as well as developing appropriate predispositions, attitudes, and values” (Patwardhan and Mohanan 2022). These factors could be more carefully considered as accreditation processes are adjusted.

As guiding principles for improvements to the accreditation process, we suggest enabling faculty autonomy and faculty empowerment. The current approach requires faculty and programs to demonstrate accountability for student outcomes but says little about the development of the faculty as individuals. Where faculty are the most critical resource in an educational institution, faculty development and motivation seems to be a fairly glaring omission in the accreditation process and much more could be done to encourage and inspire those who do the most critical work in improving educational programs.

Accreditation programs could find a role in shaping what being in academia means to young faculty. University departments in some regions are finding it more difficult than in the past to find motivated and qualified application for open faculty positions. With engineering salaries rising, departments may find it challenging to compete for new PhD graduates as industry becomes a more attractive option. In the authors’ experience, some graduating PhD students have the impression that teaching classes and running a large, well-funded research program is difficult and perhaps not



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worth the effort. To sustain high quality engineering faculty, increasing the attractiveness of faculty positions and the academic life may be needed. This could be considered as accrediting bodies evolve their program and strategies to best meet the overall goal of high quality educational programs.

At the broad level, we believe the following primary factors should guide the accreditation framework and the actual audit:

- (1) Trust, rather than distrust, as that is a central factor in working towards excellence. This may require that detailed requirements for programs from accreditation standards be reduced and evaluators given more latitude to make qualitative judgements.
- (2) Documentation of assessments and evaluation should be lean. Conscientious, well trained evaluators should look beyond assessment data and focus on the linkage between evaluation of assessment results and program improvement. For reasons discussed in the previous section, there may need to be more reliance on qualitative rather than quantitative data. If there is not a real connection, the program should be docked for overdoing the documentation, no matter how massive it is. A program with limited data and real improvement should be rewarded. In no case should a program prepare documentation that would require evaluators more than a few hours to review.
- (3) In order that the above factors can properly inform the accreditation process, in respect of evaluator choice, the following requirement may be desirable:
  - In respect of industry evaluators, those either with significant academic inclination or academic experience should be preferred so as to hopefully ensure even application of evaluation standards.
  - As far as possible, academic evaluators should themselves be passionate educators so that they can spot efforts towards excellence, or lack of them, and encourage/advise them further during the audit.
- (4) A minimal pre-visit documentation, such that it can be prepared by the faculty and reviewed by evaluators in a few hours of time. In fact, since accreditation is about the processes and methods employed by an institution in its day-to-day academic activities, in a certain sense there should not be any need for special documentation at all.
- (5) A lean evaluation visit. The accrediting committee should visit an institution at reasonably short notice, talk to stake holders, look at the documents that the departments prepare in course of their day-to-day work, and render a decision.
- (6) The success and long-term impact of accreditation may depend as much on the approach and attitude of evaluators as on the details of the process. In addition to traditional accreditation decision outcomes (full accreditation or weaknesses or concerns to address), the evaluation visit could provide the program with a brief statement of the strengths and unique contributions of



the program and its faculty as recognized by the evaluators. Evaluators may use the opportunity to encourage program faculty and provide positive feedback. Given the importance of intangible motivators in the teaching enterprise, this type of formative feedback shows respect to the need for faculty autonomy and could be as impactful in guiding and encouraging a thoughtful faculty as the accreditation process itself.

### CONCLUSIONS

Our purpose is to assess the assessment regime and improvement processes currently imposed by accreditation requirements. Is it helpful? Is it promoting program improvement? How can our approach to accreditation be improved?

Accreditation currently consists of two basic pieces: (1) a standard for program topics and course content and (2) a process-driven approach for evaluation and improvement. We are proposing that revisions be effected in these two areas in the following way: The first area, a standard for course topics, can be continued but with more flexibility to the institutions. In doing so, while it is acceptable that the accrediting body has the task of ensuring a certain level of parity of programs offered across institutions, it should also be recognized that engineering faculty at least in-principle know better about what the content ought to be. One way of doing this is to further reduce the minimum credits expected for 'core' courses. The second area, data driven improvement processes, can be reduced in magnitude and focus more on qualitative assessments. We believe this may not be too difficult: a good discussion by a quality assessor with students, faculty and employers can throw far more light on the quality and content of a program than any number of documents. While we agree that this is still a generic statement, more discussions between accrediting bodies and passionate teachers may lead to framing of more concrete methods. Finally, we propose that a third element can be added: (3) recognition of the need for faculty empowerment and freedom to innovate, a central requirement in ensuring faculty enthusiasm and hence in an effective educational experience for the students (Selvan and Warnick 2021). One way to support this third aspect of accreditation is that the assessment report focus on the strengths of the program rather than simply rendering a critical assessment decision. As has been noted by Boulton and Lucas (2008), formal requirements alone cannot motivate the inspiration, devotion, and enthusiasm that is the backbone of academic excellence.

This article forms a part of an ongoing dialog between accrediting bodies and program faculty who implement accreditation requirements and processes. It is our hope that the discussion and suggestions we provide will be heard and considered by accrediting bodies, so that the impact





of the accreditation process can be improved for programs around the world. Our recommendations are informed by our experiences in different world regions, so some of our proposals may already be in place in some areas while lacking and more pressingly needed in others. We expect that this conversation will lead to modifications to our approach to accreditation to accommodate shifts in student and faculty employment conditions and needs of constituents in higher engineering education.

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