AC 2011-109: ENGINEERING MANAGEMENT PROGRAM ACCREDITATION: COMPARING AACSB AND ABET

Amy K. Zander, Ph.D., P.E., Clarkson University

Amy K. Zander is a professor and the Director of the Engineering & Management program at Clarkson University, Potsdam, NY. She has been an engineering educator since 1991 and a member of ASEE since 1993. She holds M.S. and Ph.D. degrees in civil engineering from the University of Minnesota.

Engineering Management Program Accreditation: Comparing AACSB and ABET

Abstract

It is feasible for engineering management, industrial engineering, management information systems or similar programs to achieve accreditation by both the Association for Advancing Collegiate Schools of Business (AACSB) and ABET Engineering Accreditation Commission (EAC) or Computing Accreditation Commission (CAC). A small number of programs have done so and there is active movement toward this end by some other programs. Most of the criteria of each accrediting body are compatible or even synergistic. This paper explores the similarities and differences in the accreditation philosophies of the two accrediting bodies and how those philosophies apply to engineering management programs in particular.

Introduction

Accreditation provides external assurance that a program or institution meets established quality standards. It is a process in which certification of competency, authority, or credibility is presented.

Many programs are accredited by multiple accrediting bodies (e.g. Middle States Commission on Higher Education and ABET, or North Central Association of Colleges and Schools and AACSB.) However, some feel that ABET accreditation and AACSB accreditation are mutually exclusive bodies. There are a few programs, with an interdisciplinary nature, that can be dually accredited by both AACSB and ABET. Accreditation by both AACSB and ABET proves to a student that the program is differentiated from programs that are "engineering only" or "business only", the program does not reside somewhere between engineering and business, but is firmly planted in both engineering and business. It allows the program to become a legitimate home for faculty with boundary-spanning interests as well. And it allows the university to demonstrate its focus in quality programming that sets it apart from its peers. It is a true differentiator for a program to be judged as a high quality program in these two most important realms.

Dual accreditation by both ABET and AACSB could be a benefit to undergraduate programs in fields that span engineering and business. These can include management information systems, industrial engineering and management, and the field of interest here – engineering management.

ABET, Inc., has been the recognized accreditor for college and university programs in applied science, computing, engineering, and technology for more than 75 years. Among the purposes of

ABET, Inc. (ABET) are two that relate to accreditation. ABET intends to 1) organize and carry out a comprehensive process of accreditation of pertinent programs leading to degrees, and assist academic institutions in planning their educational programs, and 2) promote the intellectual development of those interested in applied science, computing, engineering, and technology professions (ABET Policy, 2008). The Engineering Accreditation Commission (EAC) evaluates and accredits individual degree programs with the word "engineering" in their title. ABET accredits programs only, not degrees, departments, colleges, or institutions.

The Association to Advance Collegiate Schools of Business, AACSB International (AACSB), accredits collegiate institutions offering degrees in business administration or accounting. The association first set standards for business administration in 1919 (AACSB International, 2010).

While one body accredits engineering programs and the other accredits entire institutions, an engineering management program can fall under the purview of both bodies. Both bodies require a self-evaluation and a peer review, and both enter the program or institution into a strategic improvement process to maintain accreditation. This paper compares and contrasts the accreditation procedure of the two bodies for an engineering management program.

Basic Requirements for Accreditation Eligibility

Many criteria are associated with accreditation by either AACSB or ABET. But eligibility to be considered for accreditation by each body has a few key distinctions that make it feasible to become dually accredited.

A program can be considered for ABET accreditation if it has the word "engineering" in the program title and specifically, if one and one-half years or 37.5% or more of the course credits in the program are in "engineering topics" (ABET Criteria, 2009) consisting of engineering sciences and engineering design appropriate to the student's field of study. By definition (ABET Criteria, 2010):

> "The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is the process of devising a system, component, or process to meet desired needs. It is a process…in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs."

These are courses beyond the basic math and sciences; in an engineering management program examples of these could be Statics, Materials Science, or Project Management.

AACSB accredits institutions that offer degree-granting programs in business or management (or accounting). Included in the definition of institution for the purpose of AACSB accreditation are all undergraduate degree programs at the university that permit 25% or more of the teaching to be in traditional business subjects. It further defines a non-exhaustive list of traditional business subjects (AACSB, 2010):

> "Accounting, Business Law, Decision Sciences, Finance…, Human Resources, Management, Management Information Systems, Management Science, Marketing, Operations Management, Organizational Behavior, Organizational Development, Strategic Management, Supply Chain Management…, and Technology Management."

Any engineering management program with 37.5% or more course credits in engineering topics and 25% or more of teaching in traditional business subjects would be eligible to seek dual accreditation by both ABET and AACSB. Courses often found in engineering management curricula that could be considered traditional business subjects would include the above courses, but also Project Management and Quality Management, both of which are common offerings in engineering management. Similarly a program could become dually accredited in industrial engineering, management information systems or similar programs.

In fact, AACSB considers that programs which provide 25% or more of the teaching in business subjects are presumed to be a business program and be included in an AACSB review unless the program is specifically excluded from the review by the institution. Degree programs can be specifically excluded from the review if they are eligible for accreditation by another accreditation society, if they are a specialized degree program (such as engineering management), or if they are clearly distinguishable from the included programs by published descriptions and other representations to students, faculty and administration (AACSB, 2010).

Accreditation Philosophy

ABET accreditation is intended for programs that prepare graduates for entry into a profession appropriate to the program's discipline. The philosophy of accreditation is strongly oriented toward outcomes-based accreditation and continuous quality improvement. As defined in materials used to train program evaluators, outcome-based accreditation focuses on:

> "Learning, not teaching;
> Students, not faculty; and
> Outcomes, not inputs or capacity" (ABET Training, 2010).

In addition to the outcomes-based assessment, ABET sets standards for several criteria, involving the program mission, constituents, objectives, outcomes, etc. which the program must demonstrate clearly they meet. Accreditation involves a Self-Study Report, a visit to the program by a program evaluator and a report to the ABET Board of Directors. Once accredited the institution undergoes re-evaluation of all of its programs typically every six years.

AACSB uses a mission driven philosophy with a focus on an overall high quality educational experience and continuous improvement. It maintains a focus on clear determination of an institution's mission, development of its faculty members and planning and delivery of its instruction. Like ABET, AACSB looks at the total educational experience that emphasizes conceptual reasoning, problem-solving skills and preparation for life-long learning.

Once accredited the institution embarks on a continuous process which includes an annual report of data and a five-year review of strategic progress. In contrast to the philosophy of ABET, AACSB looks into social aspects of a student's education, and requires the institution to demonstrate the inclusion of diversity. It must include diverse viewpoints among participants and prepare graduates for careers in the global context. Students must be exposed to cultural practices other than their own. Also, the institution must establish and enforce expectations for ethical behavior by administrators, faculty and students.

While ABET is focused mainly on what a student learns in terms of outcomes, AACSB has a slightly greater emphasis on the environment in which a student learns. However, similarly to ABET Criteria, AACSB sets Standards which the institution must demonstrate they meet. This means the assessment of learning portion of the two accreditation bodies is actually quite similar in scope and detail. The process of outcomes assessment and assessment of learning could be designed by a program to fulfill the requirements of both accrediting agencies with a single process.

Comparison of Accreditation Criteria and Standards

The criteria for accreditation by the two accreditation bodies have many more similarities than differences. Some terms, such as outcomes and goals, are used differently between the two bodies and some characteristics are differently emphasized. But the main backbone of both criteria is extremely similar. It is possible to specifically map the ABET Criteria to the AACSB Standards, or as shown in Table 1, the 20 Standards of AACSB can be mapped readily against ABET's seven general criteria. AACSB breaks some of ABET's criteria in to several categories, but some categories have a one to one mapping such as ABET *Criterion 4: Continuous Improvement* and AACSB *Standard 4: Continuous Improvement Objectives*; and ABET *Criterion 5. Curriculum* and AACSB *Standard 17: Undergraduate Education Level.*

We can look at the specific details of the comparison for each category of Criteria and Standards.

In ABET *Criterion 1. Students*, it is expected that the program have a documented process for admitting students. The program must evaluate student performance, advise students, and monitor their success in achieving program outcomes. They must have in place and enforce policies for transfer credit and ensure all graduates meet all program requirements.

This is similar to AACSB *Standard 3: Student Mission*; *Standard 6: Student Admission*, *Standard 7: Student Retention* and *Standard 14: Student Educational Responsibility*. These requirements ask that the mission statement of the school specify the type of student populations the school intends to serve, as the student population is influential in determining educational practices. Admission policies must then be consistent with the school's mission. The school must have academic standards and retention policies which produce high quality graduates. Unstated in the ABET criteria but certainly implied is the AACSB requirement that students operate with integrity in all of their dealings with faculty and other students, and that students maintain their engagement when challenged by difficult learning activities.

Table 1: A mapping of AACSB Standards to ABET General Criteria

ABET General Criteria	AACSB Standards
Criterion 1. Students	Standard 3: Student Mission Standard 6: Student Admission Standard 7: Student Retention Standard 14: Student Educational Responsibility
Criterion 2. Program Educational Objectives	Standard 1: Mission Statement
Criterion 3. Program Outcomes	Standard 15: Management of Curricula Standard 16: Undergraduate Learning Goals
Criterion 4. Continuous Improvement	Standard 4: Continuous Improvement Objectives
Criterion 5. Curriculum	Standard 17: Undergraduate Educational Level
Criterion 6. Faculty	Standard 2: Intellectual Contributions Standard 10: Faculty Qualifications Standard 12: Aggregate Faculty and Staff Educational Responsibility Standard 13: Individual Faculty Educational Responsibility
Criterion 7. Facilities	
Criterion 8. Support	Standard 5: Financial Strategies Standard 8: Staff Sufficiency – Student Support Standard 9: Faculty Sufficiency Standard 11: Faculty Management and Support
Graduate level not considered for undergraduate engineering programs	Standard 18: Master's Level General Management Learning Goals Standard 19: Specialized Master's Degree Learning Goals Standard 20: Master's Educational Level Standard 21: Doctoral Learning Goals

ABET *Criterion 2. Program Educational Objectives* directs a program to have educational objectives describing the career accomplishments the students are preparing to achieve after graduation, that are consistent with the mission of the institution. The objectives must be devised with input from constituencies and meet the needs of those constituencies. The objectives must be periodically reviewed with input from the same constituencies. Very similar to this, AACSB *Standard 1: Mission Statement* states that the school must have a mission statement that derives from a process that includes the viewpoints of several stakeholders. It must be consonant with the mission of the larger institution. The mission must be periodically reviewed and include the appropriate stakeholders in the review. With a slight change in terminology, these are nearly the same requirement.

In ABET *Criterion 3. Program Outcomes* expected student outcomes for indicating what the students are able to do by graduation must be developed and be consistent with ABET's (a) through (k) Student Outcomes. ABET (a) through (k) are given here (ABET Criteria, 2010):

Engineering programs must demonstrate that their students attain the following outcomes:
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The Outcomes must also be related to the Program Educational Objectives. Additional Outcomes can be applied for a particular program.

While not being quite as proscriptive, AACSB *Standard 16: Undergraduate Learning Goals* also requires the school to specify learning goals for each undergraduate degree program. *Standard 15: Management of Curricula* lists management-specific knowledge and skills that it would be likely that an undergraduate management degree program should include (AACSB, 2010):

- Ethical and legal responsibilities in organizations and society.
- Financial theories, analysis, reporting, and markets.
- Creation of value through the integrated production and distribution of goods, services and information.
- Group and individual dynamics in organizations.
- Statistical data analysis and management science as they support decision-making processes throughout an organization.
- Information technologies as they influence the roles and techniques of management.
- Domestic and global economic environments of organizations.
- Other management-specific knowledge and abilities as identified by the school.

Engineering management curricula would have little trouble creating outcomes or goals that meet both of these somewhat overlapping lists.

ABET *Criterion 4. Continuous Improvement* and AACSB *Standard 4: Continuous Improvement Objectives* both ask that the program or school develop a priority for actions taken to improve the program or school, and evidence that those actions have been addressed.

ABET *Criterion 5. Curriculum* specifies the subject areas appropriate to an engineering program but does not prescribe needed courses. It charges the program with ensuring that the program

curriculum devotes adequate attention and time to each component, while being consistent with the outcomes and objectives. The requirement for topical coverage includes:

- One year of a combination of college level mathematics and basic sciences (or 25% of the course credits);
- One and one-half years of engineering topics (or 37.5% of the course credits);
- A general education component that complements the technical content of the curriculum.

AACSB *Standard 17: Undergraduate Educational Level* simply states that the undergraduate level degree programs within the school "provide sufficient time, content coverage, student effort, and student-faculty interaction to assure that the learning goals are accomplished." (AACSB, 2010)

ABET *Criterion 6: Faculty* and AACSB *Standard 2: Intellectual Contributions*, *Standard 10: Faculty Qualifications*, *Standard 12: Aggregate Faculty and Staff Educational Responsibility*, and *Standard 13: Individual Faculty Educational Responsibility* all look into the character of the faculty in the program or school. In ABET, the overall competence of the faculty can be judged by looking at education, experience, teaching effectiveness and experience, ability to communicate, and enthusiasm for the program, in addition to the faculty's level of scholarship, participation in professional societies and professional licensure. AACSB separates similar criteria into several standards. *Standard 2: Intellectual Contributions* asks that the school's mission incorporate a "focus on the production of quality intellectual contributions that advance knowledge of business and management theory, practice, and/or learning pedagogy." (AACSB, 2010). It seeks a portfolio of aggregate faculty contributions, rather than looking at vitae of individual faculty members. It expects the school to provide stated expectations of the outcomes of scholarship, and that the faculty as a whole are dedicated to continuous improvement in faculty contributions. *Standard 10: Faculty Qualifications* asks that the school define academically qualified faculty and professionally qualified faculty and the initial and on-going requirements of the school for a faculty to maintain themselves as either academically qualified, professionally qualified or both.

AACSB *Standards 12* and *13* allow that the aggregate faculty and individual faculty are responsible to ensure adequate time is devoted to learning activities, adequate student-faculty contact, high expectations for student achievement, provide innovation in instructional processes and continuously improve instructional programs. It may be a small distinction, but it seems clear that the responsibility for the quality education belongs to the faculty for AACSB and to the program for ABET.

ABET *Criterion 7. Facilities* does not appear to have a direct complement in the AACSB Standards, however, *Standard 5: Financial Strategies* does make reference to being certain the financial strategies of the school are strong enough to provide facilities that are adequate for high-quality operations.

The final ABET Criterion is *Criterion 8. Support*. This can be mapped to several standards from AACSB. *Standard 5: Financial Strategies, Standard 8: Staff Sufficiency – Student Support, Standard 9: Faculty Sufficiency*, and *Standard 11: Faculty Management and Support* all

contribute to the recognition of the support the university provides to the school or programs. As indicated by the titles, both ABET and AACSB are looking to ensure that the university provides sufficient support for the programs that they can attract and retain students and faculty and provide an on-going quality educational experience. Both accrediting bodies respect the role of support personnel and institutional services in this endeavor.

Conclusion

ABET and AACSB share a great similarity in their philosophy of accreditation. It is possible to have a single set of standards / criteria and outcomes / goals that would satisfy the accreditation requirements of both bodies. In fact even the categories of standards and criteria show synergism. What ABET terms as Outcomes Assessment can be quite readily translated into AACSB's Assessment of Learning. The crux of both accrediting bodies is that the school or program must provide for the setting of known objectives for a quality educational experience, consistent with the mission of the university and developed with the cooperation of those affected by the educational experience. They must provide a method by which the school or program measures attainment of those objectives. Finally, they must provide a strategic plan for the implementation of continuous improvement consistent with the measures.

Differences that can be seen in the two bodies include that AACSB does not seem to provide guidance as to what the graduates of a program can be expected to achieve following graduation. This would be what the Program Educational Objectives provide within ABET. AACSB takes a different approach to ABET on expectations of the faculty. AACSB places more emphasis on the faculty for provision of a quality educational experience, while that is laid more on the program in ABET. AACSB emphasizes the importance of the diversity of the student body and faculty and the provision of a global management experience while in undergraduate school. Also, it appears that while ABET emphasizes ethical knowledge, AACSB emphasizes evidence of ethical actions.

These differences are readily incorporated to make it feasible to allow a single set of core outcomes / goals to be used to assure both accrediting bodies that the educational experience of the students meets with their expectations.

Bibliography

Accreditation Policy and Procedure Manual, ABET, Inc. Baltimore, MD. Web: http://www.abet.org.

Criteria for Accrediting Engineering Programs, ABET, Inc. Baltimore, MD. Web: http://www.abet.org.

Eligibility Procedures and Accreditation Standards for Business Accreditation, AACSB International – The Association to Advance Collegiate Schools of Business, Tampa, FL. Web: http://www.aacsb.edu.

Module 1: Overview, ABET, http://www.abet.org/_TrainingCD/data/module1/aPartnershipForQualityEducation.htm, downloaded December 10, 2010.