The Integrated Strategies and Implementing Processes of the Accreditation Criteria in Taiwan

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KEYWORDS: *Engineering Education Accreditation*

ABSTRACT: *Due to the industrial development in Taiwan, there is inconsistency between the university's cultivation on highly-trained engineers and those demanded by the high-tech industry. In order to remain competitive, the implementation of international accreditation standards in Taiwan has become an urgent need, which will facilitate the acceptance of domestically-trained engineers on the global market. Through a careful literature review, this paper first summarizes the crucial events in engineering education that led to the evolution of engineering education in Taiwan. Next, this paper describes the formation and implementing processes of the international accreditation criteria in Taiwan. Such criteria are expected to be "substantially equivalent" to those adopted by the international bodies, such as the Washington Accord Signatories. Finally, this paper indicates to provide some useful guidelines for improving the teaching and learning effectiveness of the curricula, so that Each university's mission can be better achieved.*

1 INTRODUCTION: PROBLEMS AND EVOLUTION OF ENGINEERING EDUCATION IN TAIWAN

Through a careful literature review, crucial factors in engineering education that led to the formation and implementation of the accreditation criteria in Taiwan are summarized below. This development provides implications for improving teaching and learning effectiveness of engineering education in Taiwan [1] [2].

1.Inconsistent cooperation between universities and industry
2.Institutions' urgent need to identify school characteristics and future development
3.Concerns regarding implementing of accreditation criteria into the college environment
4.Evolution of engineering education in Taiwan

As background for this, we would like to review some of the important events for engineering education in Taiwan that led to the formation and implementation of this workshop, starting from their inception in 1994 [3]. Recognizing the importance of improving and accelerating progress in engineering education, the first International Conference of Engineering Education (ICEE) was initiated by engineering education professionals in Taiwan in 1994 with a vision of doing so by means of sharing experiences. The purpose of the International Conference on Engineering Education (ICEE) is the advancement of education through trans-national cooperation and cross-cultural networking. It is a

conference series that highlight the worldwide progress and experiences in engineering education; it is also a platform for creating mutually beneficial collaborative efforts.

Organized as a forum to disseminate and exchange information, the ICEE emphasizes the propagation of information on state-of-the-art advances in education and research, especially new approaches that address the education needs of young engineers for the 21st century. In addition to being an occasion for discussing the development of engineering education worldwide, ICEE represents an opportunity for fruitful encounters between various cultures. Although the focus of these first two years was largely an issue in Taiwan, there was already international integration with researches from other countries in Europe and Asia. Thanks to the long-term endeavor of participants from many countries, the trends of engineering education in Taiwan were already clear in these first two years, including curriculum innovations, the use of multimedia and computers for instruction, and the integration of theoretical and practical courses.

1997 was a turning point for ICEE. Having the conferences outside Taiwan, in Chicago, it highlighted the worldwide experiments and experiences in engineering education. This conference also emphasized the positive effect of government activism in support of pedagogical renewal and reform. Indeed, it was an important forum on engineering education at the turn of the millennium and for engineering opportunities for international collaboration.

Finally, we would like to conclude this background by portraying current and future emphases in our field, thus paving solid road for further research and development. Two trends of engineering education can be summarizes from previous meetings:

1.Continuous international collaboration to strengthen alliance for engineering education, including demonstration of global engineering practices, discussion on higher education models, etc.
2.Continuous curriculum reform to meet industrial need, including the development of new curricula, reengineering of education systems, curriculum restructuring or reform, partnerships with industry, university-industry collaborations, disaster reduction education, creativity and innovation in education, etc.

Two foreseeable visions of engineering education can be outlined from previous conference discussions:

1.The researchers and practitioners in this community will further recognize the essence of multidisciplinary field and realize that the complexity and sophistication of new developments can be facilitated only through collaboration among experts with different backgrounds.
2.The use of technology in the field of Engineering Education will bring to lights issues of ethics and literacy.

Finally, the Deans' Conference for Public and Private Higher Education in 2002 also portrayed current and future emphases in engineering education in Taiwan, thus facilitating a close contact with international engineering accreditation bodies. Three trends in Taiwan's engineering education can be summarized from these events:

1.Continuous international collaboration to strengthen alliance for engineering education in Taiwan.
2.Continuous curriculum reform to meet industrial need.
3.Processes implemented for faculty development should be in place to assure faculty involvement and to assure systematic quality of assessment processes.

The above literature review thus suggests an important direction: to establish an accreditation criteria by which programs are evaluated for the effectiveness of curricula and ongoing improvement of the program. For a country which is moving rapidly towards internationalization, accreditation process/criteria will be an effective tool to connect with international engineering education. Furthermore, if there are graduates cultivated by engineering education system from two or more countries who received comparable degrees, the implementation of international accreditation will facilitate the mobility of engineers in the global market.

A consideration at past problems and the current trends for engineering education in Taiwan shows the vital role of systematic accreditation criteria in improving the quality of engineering education in Taiwan. Even though there are on-going institutional assessments in Taiwan, the results seem to be not very satisfactory due to the lack of a systematic and objective process. In the past, each field handled assessment or accreditation independently, with no common language between fields. The accreditation

of each field represented certain level of quality in its own field, but there was a lack of consistency in quality among different fields. Therefore, the results cannot be used as an effective foundation for linking with international standards.

2 MISSION AND VITAL ROLE OF IEET

1. The introduction of IEET

For implementing engineering education criteria and improving higher engineering education in Taiwan, the IEET (Institute of Engineering Education Taiwan) was established in 2003. Though IEET is a non-governmental organization, supported by government is crucial. Over the past several years, many educators and industrial managers have been concerned about the contemporary problems of engineering education, although they lacked a mediator to encourage both universities and industry to reach a consensus. Therefore, with the recognition by the Ministry of Education and National Science Council of the government, IEET serves as an unique organization to promote the quality and innovation in the higher education in Taiwan. More importantly, IEET encourages the establishment of accreditation criteria and procedures that are comparable with the experienced of ABET in United States and those of other well-known internationalized criteria such as IEAust in Australia, HKIE in Hong Kong, CEAB in Canada, and EC in the United Kingdom.

Basically, IEET is composed by two major systems: one is the General Administration System and the other is the Accreditation System (see Figure 1).

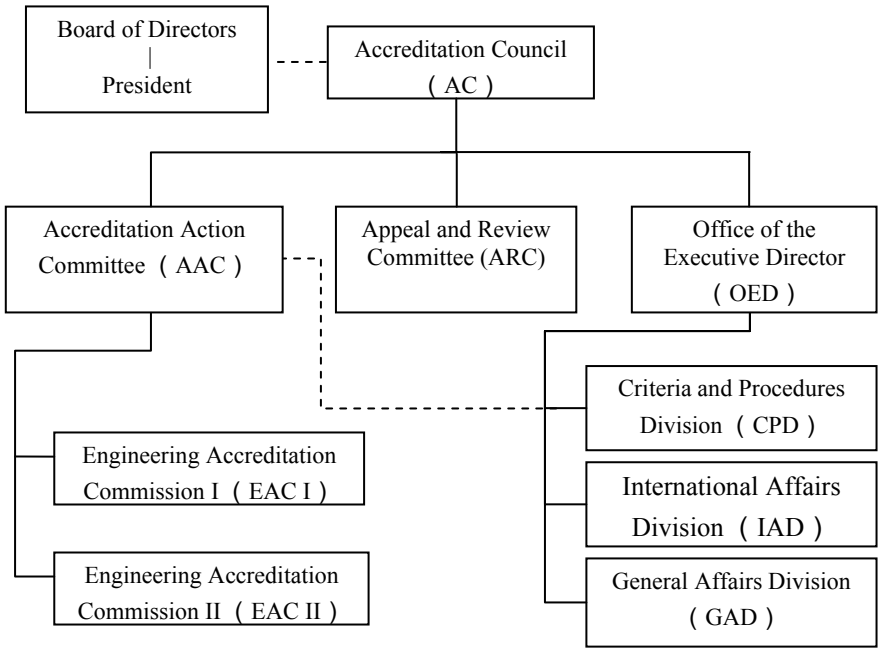

Figure 1 - The structure of Accreditation System of IEET

As shown in Figure 1, the head of the Accreditation System is the Accreditation Council (AC). Supervised by the AC, the Accreditation Action Committee (AAC) is the pivot to implement the accreditation process.

In Taiwan, there are two main branch systems of education. The first one is the technological and vocational education system that is composed of five-year junior colleges, and technological universities or colleges. The second one is the general higher education system that is composed of the regular process of four-year undergraduate degrees. Among the higher education institutes in Taiwan, there are more than 80 schools belonging to the technological and vocational system, and at least 135 colleges or universities in the general higher educational system. The major difference between these two systems is that they are implemented and supervised by different divisions of Ministry of Education in Taiwan. Therefore, in order to implement the accreditation process more efficiently, the Engineering Accreditation

Commission I (EAC I) will be in charge of the accreditation for the engineering degree of the general higher educational system, whereas the Engineering Accreditation Commission II (EAC II) will administer the on-site accreditation issues for the colleges or schools within the technological and vocational education system.

2. The past and future of IEET

Over the past six month, IEET has made great efforts to set the stage for accreditation. The first step is to send highly qualified candidate-evaluators to observe the on-site accreditation procedures at Washington Accord signatories' institutions. For instance, four professors participated in the ABET/ASCE Program Evaluators Workshop in November of 2003, and a large group including more than 30 members from university and industries organized by the Ministry of Education played a significant part at the "2nd ABET International Faculty Workshop for Continuous Program Improvement" in Singapore on December of 2003 [4]. Meanwhile, IEET invited several experts, such as Dr. Gloria Rogers from the Rose-Hulman Institute of Technology, to conduct a hands-on assessment methodology workshop on the topic of outcome-based engineering education accreditation.

In the past, each field used its own assessment method, leading to a lack of consistency in level of quality among different fields. Hence, to establish criteria that are appropriate to Taiwan's contemporary situation is strongly desired. In the next section, these strategies are described in detail.

3 STRATEGIES FOR IMPLEMENTING ACCREDITATION CRITERIA

However, implementing the comprehensive accreditation criteria to meet the needs for all institutions presents a major challenge. During the process of implementing the accreditation criteria, IEET has adopted a five-step set of systematic strategies to ensure its validity and the practicability. These strategies will complement the other actions to serve as a continuous improvement system.

· *Strategy 1. Integrates EC2000, HKIE, IEAust, CEAB with Taiwan's Existing Evaluation Methods*

This comparison of criteria is intended to stimulate discussion of accreditation criteria in order to lead to greater faculty interest and participation in accreditation-related activities. First, we review the on-going university evaluation index, as well as the technological college evaluation index to explore the previous path to accreditation. These existing assessment methods are input-based.

Table 1.Comparison of Abet and IEET Accreditation Criteria

	ABET EC 2000	IEET AC2004 (tentative)
Characteristics	1. Outcome-based 2. Loop of continuous program/institutional improvement	1. TAC/EAC separate systems 2. Professional development training 3. Bottom-up model
Highlights	1. 8 general criteria 2. 11performance outcomes and assessment 3. Emphasizes educational objectives of program	1. Integrates EC2000, HKIE, IEAust, CEAB with existing evaluation methods 2. Emphasize the effectiveness of engineering programs, not to make the ranking
Strengths	1. Flexible 2. Involves all constituents 3. Encourages innovation	1. Distinguishes between systems of EAC-I and EAC-II
Future Modifications	Non-technical criteria may be too vague to evaluate	1. Still searching for a way to fulfill both outcome-based and input-based assessment process

In addition, due to the huge difference among engineering programs, we have adopted ABET EC 2000 to encourage programs to define and measure desirable outcomes of our graduates in Taiwan. Basically, EC2000 uses two factors to make performance assessments, whether a program has been assessed as having observable and specific objectives for its course content, and whether it shows

continuing improvement. This internationally well known accredited criterion, EC2000, is considered as an outcome–based accreditation, providing guidelines for universities to find their own characteristics and directions.

Next, we compare the EC-2000 with the IEET criteria to find their strengths and weaknesses. A summary of characteristics and highlights are provided in Table 1.

After an in-depth review of existing assessment methods in Taiwan and of the well-known internationalized criteria, the CPD (Criteria and Procedures Division) of IEET then undertook the important task of drafting the criteria for engineering education accreditation.

· *Strategy 2. Conduct Focus Groups to Achieve Consensus on the Meaning of Each Criteria*

The purpose of these focus groups is to encourage faculty participation during the development and revision of criteria. Meanwhile, seeing the difficulties of reaching consensus during the group discussion may provide relief and insight for many engineering faculty, who will undertake similar challenges or debates during the assessment process on campus.

· *Strategy 3. Reinforce Faculty Rewards and Incentives*

The goal of this strategy is to incorporate the internally driven assessment (e.g. pedagogical improvement) with externally driven assessment (accreditation) to reinforce faculty rewards and incentives[5]. Therefore, a faculty development team was organized to involve multi-disciplinary engineering faculty, and this could be sustained with both internal and external incentives. The purpose of this faculty development training is to provide administrators, curriculum and accreditation committee members, as well as key faculty with an understanding of what is involved in establishing an assessment program in an educational environment. Therefore, two goals are specifically defined:

(1)Provide faculty with confidence that implementation of a comprehensive assessment plan would maximize their ability to identify areas of improvement for the effectiveness of their program or institutions.

(2)Offer "just-in-time" training sessions to develop faculty knowledge and skills appropriate to their institutional missions, educational objectives and outcomes with accreditation criteria requirements.

· *Strategy 4. Collaborate with Pilot Accreditation Programs to Test the Criteria*

This strategy emphasizes the positive effect of government activism in support of pedagogical renewal and reform. After the criteria were approved by the AAC and AC of IEET, the criteria will be implemented on the on-site accreditation in the field of engineering education. Currently, the Ministry of Education sponsors seven pilot programs to collaborate with IEET to be the pilot-testing groups for accreditation. This approach was based on collaborative efforts by the Ministry of Education, administrators, faculty and educational researchers.

· *Strategy 5. Modify Criteria Based upon Results and Faculty Feedback*

During the process of drafting and revising the criteria, the test groups will provide evaluation data, such as the instructional assessment of current courses, alumni surveys, and faculty comments to provide feedback to improve the effectiveness of the implementation of engineering criteria.

Under the ABET EC 2000 requirement and each school's characteristics, the general direction and future development of each university may be decided by the individual institution to allow flexibility for schools to pursue excellence in the cultivation of their students and provide suggestions for modifications based on evaluation comments. The programs or schools will not be ranked, but rather evaluated according to how successfully they have achieved their individual missions.

4 CONCLUSIONS

A glimpse at the perceived problems in the past and future trend of development of engineering education in Taiwan shows the vital role that a systematic accreditation criteria plays in improving the quality of engineering education. This paper addresses in detail the process and strategies used to develop the first criteria for the engineering education in Taiwan. For a country which is moving rapidly towards

internationalization, this paper describes the integrated strategies to establish the accreditation criteria by which programs will be evaluated for the on-going improvement of curricula. Furthermore, this study concludes that faculty consensus and dialogue is crucial for successful implementation. Through such collaborative activity, all the constituents can finally begin to see the common objectives and outcomes across various disciplines in the near future. This is actually a crucial first step toward curriculum mapping and coherence [6]. If Taiwan's universities could respond appropriately to the needs of their constituents and build partnerships with them, not only would the interaction between education system and the public be strengthened, but also the nature of continuous improvement assessment would be genuinely implemented. In the future, we wish to encourage the accreditation programs to establish a continuous self-study structured process to demonstrate its achievements. Through objective reviews by professionals within the field, the results may provide guidelines to improve the design and implementation of curriculum and to achieve the university's mission.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge financial support from the National Science Council and Ministry of Education, R.O.C., through projects NSC 92-2745-S-008-003 and NSC 92-2745-S-002-001.

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