Session Report:

QUALIFICATION & EDUCATION

Chairperson: David Hood (Institution of Engineers Australia, Australia)
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Mr. David Hood

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Japan's System of Engineer's Education and Qualification
by Mr. Akihiko Hirotani

Sustainable Credentials
by Dr. Peter Parr & Mr. Andrew McIntyre

Developments in Engineering Education and Accreditation in the USA
by Dr. Russel C. Jones

Mr. Akihiko Hirotani

Mr. Andrew McIntyre

Dr. Russel C. Jones

1. Summary

In this session, three papers have been presented. Mr. Hirotani introduced "Japan's System of Engineer's Education and Qualification". The procedure for accreditation in Japan was very much different from European continent and English speaking countries. The Japanese Ministry of Education holds a strong control on universities. The quality assurance for the education has been secured by the Council for University Chartering and School Juridical Persons. The Ministry of Education also recommended self-monitoring and self-evaluation. At present more than 50 private universities gather to conduct the mutual monitoring and evaluation. Evaluation is extended to facility, education system, staff, curriculum, etc. but not to the engineering competency of students. In November 1999, the Japan Accreditation Board for Engineering Education (JABEE) was founded. JABEE can be considered as an equivalent organization as ABET. JABEE tries to improve the engineering education program in universities. It requires the periodical evaluation and improvement. The accreditation according to JABEE will be performed from 2002. JABEE plans to join the Washington Accord.

As for the engineer's qualification, "Gi-jyu-tsu-shi" system exists in Japan. However, "Gi-jyu-tsu-shi" system has various problems, such as the difficulty of the examination, the small number of title holders. It is merely a title and not an exclusive business license. Currently, the mobility of engineers and the multi-lateral agreement for professional qualifications become the major topics in various countries. The problem with respect to education can be solved satisfactorily so far. However, if we consider the significant decrease in population of young generation, it may provide very serious problem.

Mr. McIntyre presented the sustainable credentials for professional engineers by IEAust in Australia. For many years, IEAust has accredited educational programs offered by universities and other institutions. Due to various reasons, such as the decrease in the half-life of specific knowledge, the harmonization of technical, economic and business needs, and the expansion of interdisciplinary areas, IEAust accreditation policy has changed from the traditional curriculum based system to the outcomes based system, which requires that the graduates possess the substantial attributes. In the accreditation process, the issues related to the sustainability, the internationalization in the curriculum, and the distance education are focused.

IEAust's current membership structure comprises four levels of seniority: student, graduate, member, and fellow. Besides this membership structure, the title of Chartered Professional Engineer exists. IEAust wishes to promote the title of Chartered Professional Engineer as its highest level of membership and Australia's highest professional engineering credentials.

Dr. Jones briefly summarized the developments in engineering education and accreditation system in U.S.A. Engineering education in U.S.A. is a strong and vibrant enterprise. There are some 300 accredited engineering colleges in U.S.A. About 10% of the total student body belongs to engineering colleges. Some 60,000 students graduate with Bachelors degrees in engineering each year at present, with another 30,000 completing Masters degrees and another 6,000 completing Doctoral programs. However, compared with the mid-1980's, the number has dropped some 25%. Many engineering graduates are being employed by financial consulting firms and similar non-engineering employers.

The reverse movement against the funded research and scholarly publications as primary criteria has been gathering momentum in U.S.A. toward higher priority on undergraduate

education. This movement has been supported by consumers and also governments.

Since 1932, ABET has been responsible for the assurance of quality of engineering education. ABET has been engaged in a major reform to encourage curricular process. ABET established Engineering Criteria 2000 (EC2000). This new approach replaces previous guidelines and criteria, and has shifted the emphasis from input measures to student outcomes. Although the target of ABET is the undergraduate education, if we consider the recent innovation and improvement in the engineering, it will be required to include the graduate education for the accreditation. Engineering is a global profession. It has led to the need for mutual recognition of educational credentials. In 1989, Washington Accord established among NZ, Australia, Canada, U.S.A., Ireland, and U.K. Hong Kong and South Africa have petitioned to join it. Mexico, France, Russia and New Guinea are currently seeking signatory status.

2. Presentation Highlights

In the beginning, Mr. Hirotani introduced Japanese education system briefly. Monbu-sho (Ministry of Education) is maintaining very strong control on educational institutes in Japan. However, the transparency on education is required for the internationalization. JABEE is one of the typical efforts for the internationalization. In the field of engineering qualification, updated "Gi-jyu-tsu-shi" system and Continuing Professional Development (CPD) are the hot topics in Japan.

Finally, Mr. Hirotani pointed out that the strong current of internationalization is a back force of changes in education system and engineers qualification systems. All of which, if left simply as domestic matters, would continue to function without any problem for many more years. Major difficulty in those changes is the difference in culture and general practice between Japan and other countries. Japan's close nit society does not accept mere black and white judgment but prefers to stay very naive. Every Japanese realizes that any changes shall be made taking enough time and sufficient discussions. Internationalization, however, is surely penetrating into Japanese society and to stay as a leader of international environment, brave pioneers and decisions are needed to keep changing Japanese systems.

Mr. McIntyre explained the actual accreditation in Australia carried out by IEAust. The concept of accreditation has been changed from the traditional curriculum based evaluation to the outcomes based one. Generic attributes and more interdisciplinary aspects are required for students. This is rather new system. According to this new accreditation system, the internationalization will be promoted significantly.

Mr. McIntyre also introduced the membership of IEAust, such as student, graduate, member, and also fellow. In addition to these four levels of membership, Chartered Professional Engineer (CPEng) is established. This is the highest qualification of engineers in Australia. CPEng requires the continuing professional development. CPEng is the competency-based assessment.

Dr. Jones introduced the statistics of engineering education, especially the number of graduates in U.S.A. Although job markets in U.S.A. have changed, the engineering is still the basis for strong economy in U.S.A. As for the engineering education, user-friendly curriculum, integration of several fields, incorporated broader topics, and education technology are current hot topics. NSF has promoted the coalition programs.

ABET has the responsibility on quality assurance of engineering education. The EC 2000

criteria are based on the outcomes system. Presently, ABET accreditation is applied for undergraduate courses. However, considering the progress and advancement of engineering, the accreditation for the master's level will be required in future.

3. Conclusion

The education and accreditation systems for U.S.A., Australia and Japan are compared each other. The similarity and also the contrasts are clarified. However, for the internationalization, the transparent accreditation system should be established. As for the engineering qualification, we have found that various categories exist in these three countries, such as "Gi-jyu-tsu-shi", CPEng, and so on. However, we can find the way for the global standard. APEC Engineer is the typical model for the internationalization.

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