World Transactions on Engineering and Technology Education
Vol.3, No.1, 2004

A comparative review of two major international accrediting consortia for engineering education: the Washington Accord and the Bologna Process

Romualdas Kasuba & Pranas Ziliukas

Northern Illinois University
DeKalb, United States of America

ABSTRACT: The paper is a survey phase of a two-to-three year study of two major accreditation consortia: the Washington Accord (WA) and the Bologna Process (BP). These consortia were developed to ensure academic quality, recognition of accredited degrees and thus ease the mobility of professionals within wide geographical areas. The WA consortium was established in 1989 by six predominantly English-speaking countries: Australia, Canada, Ireland, New Zealand, the UK and the USA. The WA covers the undergraduate accredited engineering programmes for mutual recognition by all full WA members. The WA currently has eight full members and four provisional members. The BP was designed to lead towards the creation of a European Higher Education Area. The BP was initiated in 1999 with 29 signatory European countries and now has 40 full members. The BP covers all academic programmes including engineering at the undergraduate and master's levels. National or international licensing of engineers is not covered either by the WA or BP consortia. It can be envisaged that the WA and BP consortia will continue to expand and that in the foreseeable future, the WA and BP consortia will remain the major driving forces in the academic assessment field.

INTRODUCTION

This paper presents a survey of a two-to-three year study of two major accreditation consortia, namely: the Washington Accord (WA) and the Bologna Process (BP). These consortia were developed to ensure academic quality and recognition of accredited degrees, thereby easing the mobility of professionals within wide geographical areas.

The WA consortium was initiated in 1989 by six predominantly English-speaking countries, namely: Australia, Canada, Ireland, New Zealand, the UK and the USA. The WA covers undergraduate accredited engineering programmes within the WA countries for mutual recognition by all full members of the WA. The WA is in full operation. Currently, the WA has eight full members and four provisional members [1].

The Bologna Process (BP), with common expectations, was designed to lead towards the creation of a European Higher Education Area (EHEA). The BP was established in 1999 with 29 signatory European countries. Now, the BP consortium has 40 full members covering the entire continent. The BP covers all academic programmes including engineering at the undergraduate and master's levels [2].

Initial Comparisons between the WA and the BP

The WA involves the BS portion only of a *classic* BS, MS and PhD sequence. On the other hand, the BP countries have to work with a complexity of *short* and *long* BS and MS programmes, degree designations, substantial variations in the required number of credits and definition of credits for earning a degree. The BP/EHEA is in a rapid development state with defined common goals and should be fully operational by 2010. To date, it does not appear that there is a common approach for licensing professional engineers within the EHEA.

The approaches taken by the WA and BP consortia differ in flexibility and scope, but not in their principal aims leading to higher quality levels in accreditation and engineering education. It appears that the key elements of the ABET 2000 Criteria and its goals are commonly found in the WA and BP declarations [3]. Due to similarities in declarations of the WA and the BP consortia, it is expected that, with dual member-ships, the WA and BP consortia will complement each other.

Neither the WA nor BP consortia cover the national or international licensing of engineers. However, all licensing processes within the WA and BP consortia rely on their respective accreditations. It is fully expected that the WA and BP consortia will continue to expand. In the foreseeable future, the WA and BP consortia will remain the major driving forces in the academic assessment field. However, the possibilities for new consortia should not be discounted; South American, many Asian and African countries are not yet in any consortia.

THE WASHINGTON ACCORD

The Washington Accord (WA) currently has eight full members, namely: Australia, Canada, Ireland, Hong Kong, New Zealand, South Africa, the UK and USA. The WA was signed by the first six countries in 1989. Hong Kong and South Africa joined the WA in 1995 and 1999, respectively.

In 2003, Germany, Japan, Malaysia, and Singapore joined the WA as provisional members. All provisional members, before being accepted as full members, must demonstrate that they meet the WA goals and will be able to implement all of the rules and conditions set forth by the WA consortia.

To date, the WA recognises professional engineering degrees at the undergraduate level only. Engineering technology and postgraduate-level programmes are not covered by the Accord.

WA signatories, as a body, have examined the existing national accreditation criteria and have concluded that the WA countries have similar academic requirements for the practice of engineering at the professional level within the WA countries [4]. In other words, graduates of any accredited engineering programmes in any of the signatory countries will be recognised by other WA countries as having met the academic requirements for entry into the practice of engineering. However, WA signatories, as a body, are not bound to recognise programmes accredited or recognised as substantially equivalent by individual signatories outside their national boundaries.

The licensing, registration or certification of graduates as licensed professional engineers or equivalent is not covered by the WA. The overall licensing requirements vary among the WA countries and are in the domain of national licensing bodies. However, the academic requirements (graduation from the WA accredited undergraduate engineering programme), which are a *must-part* of licensing, are covered by the WA.

The WA signed in 1989 by the original six members was considered (unjustly) by some as being a closed consortium of English-speaking countries. The WA process was primarily initiated by the countries with a reasonably close match of existing academic programmes and accreditation processes without having to introduce any significant reforms. In the author's opinion, the WA, with the addition of new full members having programmes instructed-in-English or other languages, will become a significantly enhanced consortium. Certainly, all potential new WA members will have to meet the original WA expectations.

Previously, it was indicated that Germany (BP member), Japan, Malaysia, and Singapore were admitted as provisional members for future admission to full WA membership. Ireland and the UK are already full members of both the WA and BP consortia. A unified accreditation system may evolve with an increasing number of dual memberships within both consortia.

THE BOLOGNA PROCESS

The Bologna Process (BP) was initiated in 1999 when 29 European Ministers of Education signed the Bologna Declaration. Its aim was to establish a coherent and cohesive European Higher Education Area (EHEA). The EHEA seeks to ensure the quality and competitiveness of European education on a worldwide scale. By the end of 2003, the BP/EHEA membership increased to 40 countries.

The BP/EHEA membership list prior to 2003 is as follows: Austria, Belgium, Bulgaria, Czech Republic, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the UK.

It should be noted that Ministers responsible for higher education at the Conference on *Realizing the European Higher Education Area*, held in Berlin, Germany, on 19 September 2003 accepted eight new members: Albania, Andorra, Bosnia, and Herzogovina, Vatican, Russia, Serbia and Montenegro, and Macedonia, thus expanding the BP/EHEA consortium to 40 members.

The BP/EHEA activities cover all higher education programmes at the undergraduate (BS) and graduate (MS) levels. Engineering education, as a subset of the higher education, will have to meet or surpass the overall BP/EH expectations at the BS and MS levels. By contrast, the WA deals only with undergraduate engineering education.

All BP/EHEA signatories have to work on a continuous basis in order to minimise or eliminate significant differences in programmes and accreditation processes. Loosely defined, Europe has four educational systems: Western Europe, Central Europe, Eastern Europe and the Independents. All of them have very different academic programmes and degree titles. Most probably, a number of BP countries will have to introduce significant reforms that are needed for the implementation of common academic BP/EHEA policies and goals [5].

The creation of the BP/EHEA is a huge undertaking that involves 40 countries. The BP/EHEA's activities have moved forward through numerous and frequent meetings of government officials (Ministries of Education), European Universities Association (UEA) committees, national task groups and professional associations. European Student Associations are also involved in the process [6].

To date, the overall progress can be best described as being in a rapid development mode. The BP/EHEA have set strategic expectations; however, numerous tactical solutions are still to be introduced by individual countries. The entire BP/EHEA programme should be in full operation by 2010.

DIVERSITY OF PROGRAMMES, ACADEMIC CREDITS AND MUTUAL RECOGNITION OF DEGREES

The basic similarities and differences of the WA and BP consortia are illustrated in Table 1.

Table 1: Brief scope of the WA and BP systems (2002/2003).

	WA	BP
No. of Countries	8	32 (+ 8 new members)
Population	420 million	450 million + new member countries
Signatories	Professional Associations	Governments (Ministers of Education)
No. of Engineering Schools	400 (est.)	700 (est.) + new member countries
Accreditation	National criteria of WA countries	National criteria until EHEA criteria are developed
Programme Levels Covered	BS level only	Through MS level to account for various combinations of *short* and *long* BS and MS programmes
Recognition of Degrees	National Criteria	National Criteria plus Diploma Supplement until EHEA criteria are fully developed

The WA system is, in a sense, a rather simple system. As a body, all original six WA signatory countries conducted a very thorough review of the individual national criteria and processes. Following that, it was decided that they, as a body, have practically the same expectations and criteria. Consequently, all WA signatories have accepted all nationally accredited programmes within the WA boundaries as being equivalent to their own. The process was further simplified in that there were only six original WA signatories and that only undergraduate or BS programmes were covered within the classic BS, MS and PhD degree sequence.

The BP, with 40 signatory countries, will have to overcome a number of significant differences and national norms for a common equivalency of their programmes within the EHEA. The differences are not only between the research-oriented and practice-oriented programmes, but also in the definitions of academic credits, practicum hours, degrees and titles. The BP recommends to their members to institute a classic BS, MS, PhD system. The BS and MS degree programmes would be accredited under the BP/EHEA rules, which are in a rapid development cycle.

Currently, within the BP countries, there are several varieties of integrated *short* and *long* BS and MS programmes. The integrated or one-tier programmes can be generalised as a combination of *short* and *long* periods of study that lead directly to a masters degree or its equivalent. These programmes are illustrated as:

long BS + short MS		*short BS + long MS*	
3.5 – 4 yrs	1-2 yrs	3 yrs	2-3 yrs

From the integrated one-tier system shown above, it is very difficult to establish equivalency of the undergraduate component with the classical 4-year BS programmes. In extreme cases, there are some BP countries with 5-6 year undergraduate programmes.

The differences between various programmes within the BP/EHEA are further complicated because of significant differences in the definitions of credit hours versus the estimated hours of study. In order to simplify the equivalency problems, two new items were developed: the European Credit Transfer System (ECTS) credits and the Joint European Diploma Supplement. The Diploma Supplement is a rather detailed explanation of the courses, contents and credits listed in a regular transcript. At this time, there are many differences between so-called national credits and ECTS credits within the BP/EHEA and US academic credits.

For example, Lithuania and some other countries use a national credit system based on a student's overall work of 1,600 working or study hours per academic year. One national credit corresponds to 40 hours of student work consisting of lectures, laboratories, examinations, independent work, etc. Lithuanian universities have converted their programmes into a classic BS, MS and PhD sequence. Accordingly, the student completes his/her undergraduate 4-year BS programme in engineering with 160 credits, which also include credits for *practicum* or practical work assignments [7].

According to the ECTS, this would be equivalent to 240 ECTS credits. In the USA, this would be equal to about 130 semester credits (approximately 43 courses of three weekly lecture hours or other combinations of courses with 3, 4 or 5 weekly lecture hours).

There is a strong opinion in the BP/EHEA consortium that the total credits for completing separate BS and MS programmes (two-tier system) should be about 300 ECTS credits. This should be equivalent to about 160-166 semester credits in the USA. An integrated BS/MS programme (one-tier) system in the USA normally would save about nine semester credits. The integrated BS/MS programmes are not commonly available in the USA. In most cases, the recipients (permanent USA residents) of BS degrees in engineering enter the job market directly after graduation.

Currently, Switzerland is considering a two-tier degree structure: BS programmes requiring 180 ECTS credits and MS programmes requiring 90 ECTS credits, yielding a total of 270 ECTS credits. On the other hand, there are some countries where a combined minimum is 360 ECTS credits.

At this time, BP/EHEA countries are in the process of developing standalone two-tier systems (separate BS and MS programmes) in line with the BP/EHEA expectations. However, it is highly probable that various integrated BS/MS or one-tier systems will continue to exist in parallel with the two-tier system to meet some of the specific national needs of individual BP/EHEA members.

The following BP/EHEA agenda items are targeted for implementation in 2005:

- Quality assurance;
- Two-tier system;
- Recognition of degrees (Diploma Supplement to accompany all national diplomas and transcripts).

The Diploma Supplements are to be issued in a widely-spoken European language. For example, all Diploma Supplements in Lithuania are issued in both Lithuanian and English [7].

International Licensing of Engineers

As yet, there is no universal agreement for licensing engineers across international boundaries, even within the WA and BP/EHEA consortia. Most cases are considered on an individual basis. In licensing engineers for international practice, there are several concerns: differences in education, differences in national engineering standards, requisite language and communication skills, determination of significant and appropriate engineering experience, differences in definitions of professional responsibilities and accountability, etc. Most of these concerns are obviously beyond the current WA and BP/EHEA aims. However, one can be sure that graduation from the WA or EHEA-accredited (or *substantially equivalent*) programmes will be an essential common parameter for licensing engineers across international boundaries.

Accordingly, several international universities have asked the ABET to evaluate their engineering programmes according to the ABET criteria. The ABET does not accredit programmes outside the USA. However, when requested, the ABET will review international programmes for equivalency. To-date, about 100 engineering programmes at 26 universities in seven countries outside the WA and BP/EHEA consortia were determined by the ABET as being substantially equivalent to accredited programmes in the USA. It is expected that the

above determination will get a positive recognition of those graduates by the universities and licensing agencies in the USA. It is highly probable that some countries will also ask the BP/EHEA consortium to analyse their programmes for possible equivalency.

Within the USA, licensing is regulated by individual states and territories. In other countries, the licensing of engineers is mainly regulated on a national scale.

In 1994, FEANI developed the concept of *European Ingenieur* (EUR-ING) based on the length and scope of academic programmes and professional experience. FEANI is a federation of engineers that represents national engineering associations from European countries.

The level of acceptance of the EUR-ING status within the EHEA is not clear. At this time, it appears that licensing or certification of professional engineers is outside the scope of the BP/EHEA consortium.

The mobility of engineers and licensing for international practice are important aspects to all engineers. In the absence of universal licensing agreements, attempts are being made to work through the international trade agreements for developing registries of screened qualified engineers for international practice. The registries are advisory – each individual case, when requested, will be reviewed by the appropriate national jurisdictional bodies for licensing in that particular country.

In the USA, licensed professional engineers (PE) constitute only about 20% of the engineering workforce. Licensing imposes additional professional standards, rights and responsibilities, including project approvals. Licensed professional engineers are normally involved with various projects where the well-being and safety of workers, consumers and the general population are of concern.

In an effort to assist US-licensed professional engineers to practice internationally, the United States Council for International Engineering Practice (USCIEP) was formed [8]. The organisations that comprise USCIEP are as follows:

- Accreditation Board for Engineering and Technology (ABET) [9];
- American Council of Engineering Companies (ACEC);
- National Council of Examiners for Engineering and Surveying (NCEES) [10];
- National Society of Professional Engineers (NSPE).

Currently, the USCIEP is working with a number of partners to explore the possibilities for licensing engineers under several trade agreements, as follows:

- North American Free Trade Agreement (NAFTA) (Canada, Mexico and USA);
- Asia-Pacific Economic Cooperation (APEC), which was established in 1986 by 12 founding members: Australia, Brunei, Canada, Indonesia, Japan, South Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand and the USA; since that time, the APEC accepted nine new members: Peoples Republic of China, Hong Kong, Taiwan, Mexico, Papua New Guinea, Chile, Peru, Russia and Vietnam;
- Transatlantic Economic Partnership (TEP) (the European Union and the USA).

Both the WA and BP/EHEA consortia will be involved, in one form or another, in the discussions possibly leading to a universal licensing of engineers for international practice. A good example can be found in the USCIEP, where the ABET and NCEES are fully represented.

Next Phase

This report will be updated on a continuous basis to reflect the ongoing dynamic events within the WA and BP/EHEA consortia.

In the future, it is anticipated that both the WA and BP/EHEA consortia programmes will complement each other. A simplified determination of equivalence of various programmes may or may not be possible. However, it is planned to look at the possibilities for developing a *common international BS degree engineering programme* for both consortia.

REFERENCES

1. www.washingtonaccord.org/wash
2. www.unige.ch/eua
3. Engineering Criteria 2000, Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Baltimore, USA (1998). From 1995 to 1998 it was in review stage by all constituents before its final approval. It is commonly referred to as *ABET 2000*.
4. Kasuba, R. and Vohra. P., A compound assessment of an undergraduate engineering program. *Proc. 3rd UICEE Annual Conf. on Engng. Educ*., Hobart, Australia, 411-416 (2000).
5. Tauch, C. and Rauhvargers, A., Survey on Master Degrees and Joint Degrees in Europe. European University Assoc., September (2002).
6. Hernaut, K., European engineers: unity of diversity. *J. of Engng. Educ.*, January, 35-40 (1994).
7. Numerous meetings with the administrative and academic personnel dealing with the national academic, accreditation and international affairs, Kaunas University of Technology, Kaunas, Lithuania, July-December (2003).
8. United States Council for International Engineering Practice, www.usciep@ncees.org
9. Accreditation Board for Engineering and Technology, www.abet.org
10. National Council of Examiners for Engineering and Surveying, www.ncees.org