Linking Local Attributes to Global Accreditation

Frank Bullen¹, Joann Silverstein²

Abstract - Globalization of engineering is intimately linked to development of universally recognized graduate attributes and accepted accreditation processes. The accreditation “market” is dynamic and the proposed developments in Europe will place pressure on engineering educators in non-EU member countries to form alliances that allow their graduates to join the international engineering family. ABET’s international influence is largely enabled through its membership of the Washington Accord (WA) and how its “new” outcome-based programs equip graduates for the international market. As in the USA all Australian engineering educators must be able to verify the outcomes of their teaching programs as part of their accreditation by demonstrating achievement of graduate attributes as well as measuring employability of their graduates. The paper traces the linking of graduate attributes, using national accreditation and regional agreements from the local to the global scene. It is concluded that there must be globally recognized core graduate attributes to allow local accredited institutions to prepare their students for their role in the world market.

Index Terms – Graduate attributes, accreditation, globalization, measuring outcomes.

INTRODUCTION

The “future of the profession of engineering” question has been posed around the world, with the National Academy of Engineering [1] publication “The Engineer of 2020” being a typical, but largely unquantified, response to the question. In reality the future remains unknown and engineering educators are left floundering, guided mainly by their accrediting bodies. Responses by educators vary greatly covering the spectrum from the engineering science; technical skill-based qualification and to the much broader qualification based on aspects such as teamwork and communication.

The ongoing rush to internationalisation has placed a new and increased emphasis for accredited programs to be recognized without borders. This means that program accreditors must be respected and recognized internationally if their pronouncements on the quality of undergraduate degree programs are to have any credence. This has a special importance in the engineering community where graduates rely on home universities (via accreditation) to provide them with the foundation skills upon which to build an international career. While accreditation is well understood at “home”, the underlying quality assurance and control processes vary greatly around the world. Common/core attributes within accredited programs can make internationalisation viable, but only if universities are able to quantify both the skills and attributes of their graduates.

LINKING LOCAL TO GLOBALLY RECOGNIZED OUTCOMES

An institution teaching professional engineering is typically established to service the needs of its local/state community. As such it will want to provide its graduates with attributes that allow them to contribute to local society. The local institution will normally be accredited to teach its programs by some national engineering accreditation body, which will specify a set of (national) graduates’ attributes that the graduates should possess. The national body may then belong to a regional association of such bodies, where membership is based on a set of agreed graduate attributes and quality assurance processes at the local level. The information in Table I shows how accreditation at the local level can link graduates into the global market.

<table>
<thead>
<tr>
<th>Local Institutions</th>
<th>National Accreditors</th>
<th>Regional Recognition</th>
<th>Global Recognition</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Tasmania</td>
<td>Engineers Australia</td>
<td>Washington Accord</td>
<td>WFEO</td>
</tr>
<tr>
<td>University of Colorado</td>
<td>ABET</td>
<td>FEANI</td>
<td></td>
</tr>
<tr>
<td>University of Tokyo</td>
<td>JABEE</td>
<td>WHI</td>
<td></td>
</tr>
<tr>
<td>University of Nottingham</td>
<td>CPEE</td>
<td>EUR-ACE</td>
<td></td>
</tr>
<tr>
<td>University of Auckland</td>
<td>ECUK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Alberta</td>
<td>Many More</td>
<td>Few More</td>
<td></td>
</tr>
<tr>
<td>Texas A&amp;M University</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the case of the University of Tasmania (UTas) national accreditation by Engineers Australia (EA) provides regional recognition via the Washington Accord (WA). The link is ensured by educators demonstrating that graduates achieve the

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in-common graduate attributes espoused by members of the WA, including ABET.

The information in Table I show the major regional bodies and lists the World Federation of Engineering Organisations (WFEO) as the sole body that may be able to specify a set of core graduate attributes that will be recognized globally. The WA could be the ideal body to formulate such a set of attributes for consideration by the WFEO. The local/global subset concept is illustrated in Figure 1 and the reader could imagine many thousands of engineering teaching institutions providing programs that furnish graduates with attributes that both satisfy local requirement while also meeting recognized core national, regional and global attributes.

**FIGURE 1**

**LINKING LOCAL AND CORE GLOBAL ATTRIBUTES**

**LOCAL AND REGIONAL ACCREDITATION**

The Washington Accord (WA) [2] and the Western Hemisphere Initiative (WHI) are most likely the regional groupings that US readers will recognize. The WA is the older and more established body and is used as an example in this paper. The WA links USA engineering to the rest of the world, having 8 signatory countries at present (Australia, Canada, Ireland, Hong Kong, New Zealand, South Africa, United Kingdom, and the United States) and a further 4 with provisional signatory status. The Accord “recognizes the substantial equivalency of programs and recommends that graduates of accredited programs in any of the signatory countries be recognized by the other countries as having met the academic requirements for entry to the practice of engineering.” While the WA does not specify a required set of graduate attributes for its signatory members, such a set is implicit. The following national accreditation processes are provided in illustration of how local outcomes are linked to regional recognition. Table II provides a summary of some of the national accrediting bodies within the WA.

<table>
<thead>
<tr>
<th>Country</th>
<th>Accrediting Body</th>
<th>Institutions/Programs</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Institution of Engineers Australia (EA)</td>
<td>39/340</td>
<td>Washington Accord</td>
</tr>
<tr>
<td>Canada</td>
<td>Canadian Council of Professional Engineers (CCPE)</td>
<td>36/236</td>
<td>Washington Accord, Western Hemisphere Initiative</td>
</tr>
<tr>
<td>Ireland</td>
<td>Institution of Engineers of Ireland</td>
<td>11/55</td>
<td>Bologna Declaration, FIENA, Washington Accord</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Institution of Professional Engineers, New Zealand (IPENZ)</td>
<td>7/37</td>
<td>Washington Accord</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Engineering Council of the United Kingdom (ECUK)</td>
<td>114</td>
<td>Bologna Declaration, FIENA, Washington Accord</td>
</tr>
<tr>
<td>USA</td>
<td>The Accreditation Board for Engineering and Technology (ABET)</td>
<td>318/1760</td>
<td>Washington Accord, Western Hemisphere Initiative</td>
</tr>
</tbody>
</table>

Notes - The numerical data is approximate only and is intended to provide an idea on the magnitude of the accreditation work required. The data is for professional degrees only. The Australian data does not include combined degrees. It impossible to estimate the number of ECUK recognized programs.

**The United Kingdom**

The Engineering Council of the United Kingdom (ECUK) has recently developed criteria to be used for the accreditation of degrees in the UK [3]. The proposal is that graduates must achieve five learning outcomes (listed below) although it is also intended to allow for program designers to compensate between the elements of each of the outcomes. This is to promote diversity by allowing program designers to focus on the strengths of their universities and schools and thereby produce graduates with special attributes unique to that program. The ECUK provides detailed content under each of the five learning outcomes, however only the components of the last outcome are provided here and the reader is referred to the ECUK [3] for detailed content of all outcomes. The ECUK does not undertake any accreditation, which is carried out by its specialist member organisations.

1. Underpinning science and mathematics, and associated engineering disciplines.
2. Engineering Analysis.
3. Design.
4. Economic, social and environmental context.
5. Engineering Practice. This can include:
   - Knowledge of characteristics of particular equipment, processes, or products
   - Workshop and laboratory skills
• Understanding of contexts in which engineering knowledge can be applied
• Understanding use of technical literature and other information sources
• Awareness of nature of intellectual property and contractual issues
• Understanding of appropriate codes of practice and industry standards
• Awareness of quality issues.
• Working with technical uncertainty

The USA

It is assumed that the reader is familiar with the processes of the Accreditation Board for Engineering and Technology (ABET) [4][5]. The ABET criteria are very broad with coverage of basic information being more important than specific programs. Some points on the accrediting criteria follow but the reader should also refer to the full details provided by ABET.

ABET requires that the teaching institution has a program assessment process with documented results and that the assessment process must demonstrate that the program outcomes are being measured [5]. ABET moved fully to its new graduate outcome-based engineering criteria in 2000 (termed EC-2000). Prior accreditation was more prescriptive requiring a minimum of 0.5 years of social science and humanities, 1.0 year of mathematics and basic science (including specified content) and 1.5 years of specified engineering topics. A much less prescriptive engineering curriculum is now required with only 1.5 years of non-specific engineering topics being retained. A general education component that complements technical content is required, along with a year of college level mathematics and basic sciences appropriate to the discipline.

Prescriptive requirements still remain in ABET accreditation of engineering programs, notably Civil Engineering programs, where ABET requires that graduates meet the criterion of proficiency in at least four of seven defined major areas of Civil Engineering. While proficiency is not defined by specified courses, the notion of a sequence of courses that build on each other is implicit: “Proficiency implies a depth of capability beyond the introductory level. Proficiency increases through the education experience… Proficiency is developed through a curriculum and builds with the progression of courses throughout the program of study… Therefore the proficiency of a student upon the completion of a structural design course should certainly be greater than after an introduction to structural design concepts in a strength of materials course.” [6]. Similarly, program requirements for Architectural Engineering include named topics, usually identified with courses: thermodynamics, fluid mechanics, electric circuits and engineering economics, as well as proficiency areas: structures, building mechanical systems, and construction [7].

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ABET continues to refine how accredited engineering programs are evaluated in terms of assessing and achieving outcomes. Direct measures of learning are the preferred (primary) means of outcomes assessment, and include student work and performance on normed exams such as the Fundamentals of Engineering exam. To a large extent direct measures are subject-based. Other methods such as surveys of constituencies are deemed to be indirect and best used to support direct measures [8].

New Zealand

The Institution of Professional Engineers New Zealand (IPENZ) [9] accredits professional engineering degree programs that meet the standards inherent in the Washington Accord. IPENZ assures that graduate outcomes are achieved by requiring evidence that graduates have a capability profile, covered under 10 dot points, which in total mirror ABET’s. Curriculum requirements are not prescribed, other than via general guidelines although there is an expectation of national and international benchmarking. In general terms IPENZ states that the curriculum must include:

- mathematics, physical, other sciences, computing
- a systematic introduction to a particular branch of engineering
- engineering synthesis or design or project work
- exposure to skills and principles of professional practice
- social, environmental effects and ethical aspects of practice
- understanding sustainable technology and development.
- workplace skills and safety practices

Ireland

The Institution of Engineers of Ireland (IEI) has formally accredited engineering degree programs since 1982. While the IEI uses 6 typical program outcomes, it also lists program area descriptors, which must be studied if the graduates are to achieve the program outcomes. There appears to be no minimum requirement for relative content of the different descriptors [10].

Ireland (as part of European Union) is one of the 31 signatories to the 1999 Bologna Declaration and a participant in the ensuing Prague Communiqué of 2001, the Berlin Summit on Higher Education in 2002 and the planned Bergen/Norway meeting of 2005. The IEI notes that its position on the Bologna Declaration “may lead to program durations and structures which differ”, and that the existing accreditation criteria would thus need to be reviewed.

The IEI is also one of the 25 members of the FEANI (The European Federation of National Associations of Engineering) and its degree programs are recognized in those countries as satisfying the Chartered Engineer educational requirements.
The Canadian Council of Professional Engineers (CCPE) [11] accredits Canadian undergraduate engineering degree programs through its standing committee, the Canadian Engineering Accreditation Board (CEAB). The CEAB does not list required graduate outcomes as does ABET and EA, but does provide some broad statements that encapsulate those outcomes listed by ABET. For example the CEAB states, “the (accreditation) criteria are intended to reflect the need for the engineer to be adaptive, resourceful and responsive to changes in society, technology and career demands”. The CEAB statements are readily mapped to ABET’s.

Curriculum content is much more rigorously defined and an Accreditation Unit (AU) is used to provide guidelines to universities for core content. An entire program must include a minimum of 1,800AU. Mathematics and basic science must be a minimum of 420AU, engineering sciences and engineering design a minimum of 900AU and complementary studies a minimum of 225AU [8]. Thus some AU are left to allow the institution to use to define the particular attributes of their graduates, similar to the ABET approach.

Accreditation in Australia is undertaken by Engineers Australia (EA), with the primary objectives being “the maintenance of internationally benchmarked standards, the promotion and dissemination of best practice and the stimulation of innovation and diversity in engineering education”. EA identifies the parameters below as the foundation of program accreditation. These processes promote an holistic approach to engineering education.

- The teaching and learning environment
- The nature of the academic program
- The exposure of students to professional practice
- The quality systems and processes in place

The accreditation process is the responsibility of the EA Accreditation Board. As typical around the world, the Board relies on voluntary accreditation expert panels to visit institutions and make recommendations for program accreditation. One feature of the process that has proven to be of great interest in the last few years is for the school being reviewed to demonstrate how it imbues its graduates with what has been termed desirable “graduate attributes”. This need to measure and validate the attainment of attributes has stemmed from the Review of Engineering Education [12] that indicated that engineering programs must have clearly stated goals and outcomes and must equip graduates for lifelong learning. Under Recommendation 3.2 of the Review the now widely known attributes are listed. It is also stated that “engineering schools demonstrate that their graduates have the following attributes to a substantial degree”. Recommendation 3.3 sums up the present accreditation process, stating that “the accreditation of Bachelor of Engineering courses is based on demonstrated development of graduates with these attributes”. Program content is not rigidly prescribed and the guidelines for content as a percentage of the “total learning experience” are:

- mathematics, science and engineering principles, not less than 40%.
- engineering design, about 20%
- discipline specialisation, about 20%
- professional practice, management, ethics, about 10%
- more of the above or electives, about 10%

**FROM LOCAL ACCREDITATION TO GLOBAL MARKETS**

The key common element in the accreditation processes of the members of the WA is the requirement for graduates to possess a core set of attributes. It is this element that allows graduates from a regional university in Tasmania to gain entry to the engineering community in (say) London. The key issue then becomes how a university can demonstrate and quantify that its graduates possess these desirable attributes. The following section outlines one such process.

**Mapping Graduate Attributes**

Very similar to ABET, EA lists the graduate attributes that must be developed during an undergraduate degree program. One approach to demonstrate that graduates have the desired EA (and home university) attributes to a “substantial” degree is to “map” how the various graduate attributes are embedded in individual courses and programs. This would require developing individual course matrices, using information that should form part of the course outlines/synopses routinely provided to students. Such matrices need to link learning outcomes with graduate outcomes using assessment methodology. Outcomes from individual courses can then be integrated across each program and the overall outcome evaluated.

Waters [13] reviews the current situation in Australia and the UK with respect to how various universities have produced mechanisms for students to map, track and assess the development and/or acquisition of graduate attributes during their studies. Some universities provide self-assessment or portfolio building tools for students while others have developed specific courses or skills programs to equip students with the desired attributes. The University of Tasmania (UTas) has opted for the explicit embedding of skills and attributes. Waters concludes that it would be unwise to invest in software or mechanisms that “merely mapped notional graduate attributes rather than those that students actually had achieved”. The authors’ experience has shown that Schools/Departments and Faculties/Divisions should drive the embedding of graduate attributes into programs rather than the “University”.

Engineering at UTas elected to fully map all its engineering specializations linking assessment, outcomes and graduate attributes in matrices developed in-house. To create a course matrix the designer estimates to what extent each graduate attribute is addressed. Such an approach may be seen as being...
rather mechanical in nature and perhaps a somewhat imprecise measure of delivery of graduate attributes within a single course. However, when aggregated over all courses in a program, a reasonable estimate of delivery of attributes is obtained. An example of this is shown in Table III, which provides the summation of graduate attributes for all courses within School’s teaching programs (6 disciplines with approximately 550 students in total). The “a to i” in Table III represent the EA graduate attributes, for example “a” is the attribute relating to a good knowledge of basic science and engineering fundamentals [12]. The percentages listed in the various cells are an indication of the amount of the program that supports development of each attribute. It is important to note that the overall graduate attribute data is used to help decide if a program requires fine-tuning via adjustment of a few courses or via a major program review. It also substantially diminishes the likelihood of students completing a program without being made aware of their development of the desired graduate attributes. It is interesting to note that there are no target guidelines for the values in Table III.

| TABLE III. |
| GRADUATE OUTCOMES SUMMARY. |

<table>
<thead>
<tr>
<th>Discipline</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil</td>
<td>30%</td>
<td>7%</td>
<td>17%</td>
<td>16%</td>
<td>4%</td>
<td>10%</td>
<td>3%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Comp.</td>
<td>34%</td>
<td>6%</td>
<td>12%</td>
<td>19%</td>
<td>9%</td>
<td>12%</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Systems</td>
<td>33%</td>
<td>5%</td>
<td>12%</td>
<td>19%</td>
<td>9%</td>
<td>13%</td>
<td>3%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Elec. &amp; Comp.</td>
<td>32%</td>
<td>5%</td>
<td>13%</td>
<td>18%</td>
<td>9%</td>
<td>14%</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Elec. Power</td>
<td>32%</td>
<td>5%</td>
<td>13%</td>
<td>18%</td>
<td>9%</td>
<td>14%</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Mechanical</td>
<td>32%</td>
<td>5%</td>
<td>13%</td>
<td>18%</td>
<td>7%</td>
<td>10%</td>
<td>3%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Mechatronics</td>
<td>31%</td>
<td>6%</td>
<td>13%</td>
<td>19%</td>
<td>9%</td>
<td>12%</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Average</td>
<td>32%</td>
<td>6%</td>
<td>13%</td>
<td>18%</td>
<td>8%</td>
<td>12%</td>
<td>3%</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>

**Linking Mapping with Industry Satisfaction**

Accreditation processes, even within the members of the WA [2] vary greatly, from the prescriptive approach of the CPEE [11] to the more open-ended approach of IPENZ [9]. Mapping the development of attributes within a program is a useful monitoring tool but requires external verification if to be used to assist with accreditation. Industry and graduate surveys are one approach that can be used to help verify that graduates have developed desired attributes during their undergraduate program. The outcomes from one such employer survey undertaken at UTas in 2003 are summarized in Table IV.

This need to link curriculum content with outcomes has been reinforced recently in the US [14] with teachers recommending under “curriculum content, structure and delivery”, that ABET:

- close the gap between structure of accreditation and emerging curricular content.
- drive increased integration of curricular content and efficiency of structure and delivery.

One benefit from the mapping exercise and employer graduate surveys is that the School could compare claims to reality and be able to state with some confidence how employable its graduates are and what special attributes it believed its graduates to possess. For example the School could claim that, “Its graduates possess excellent discipline technical skills and have an in-depth knowledge of the role and importance of teamwork and leadership in their profession”.

| TABLE IV. |
| SUMMARY OF EMPLOYER SURVEY |

1 is disagree strongly, 2 is disagree, 3 is agree, 4 is agree strongly, 5 is agree very strongly

<table>
<thead>
<tr>
<th>Aspect</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>AV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good knowledge of basic science and engineering fundamentals.</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>13</td>
<td>4</td>
<td>4.0</td>
</tr>
<tr>
<td>Able to communicate effectively, with colleagues and the general community.</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>10</td>
<td>3</td>
<td>3.6</td>
</tr>
<tr>
<td>Good Discipline related technical competence</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>13</td>
<td>4</td>
<td>4.0</td>
</tr>
<tr>
<td>Able to understand, identify problems and formulate solutions.</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>11</td>
<td>4</td>
<td>3.8</td>
</tr>
<tr>
<td>An appreciation of using systems approach to design and operational performance.</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>11</td>
<td>2</td>
<td>3.6</td>
</tr>
<tr>
<td>Able to act as an individual and leader in multi-disciplinary and multi-cultural teams.</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>12</td>
<td>4</td>
<td>3.9</td>
</tr>
<tr>
<td>An awareness of the principles of sustainable design and development and professional responsibilities.</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>7</td>
<td>2</td>
<td>3.4</td>
</tr>
<tr>
<td>An understanding of professional and ethical responsibilities and a commitment to them.</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>10</td>
<td>2</td>
<td>3.6</td>
</tr>
<tr>
<td>An awareness of the need to undertake life long learning, and a capacity to do so.</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>11</td>
<td>3</td>
<td>3.8</td>
</tr>
<tr>
<td>Overall level of satisfaction with recent engineering graduates from the School of Engineering, UTas</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>14</td>
<td>5</td>
<td>4.1</td>
</tr>
<tr>
<td>Results of 23 Companies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.8</td>
</tr>
</tbody>
</table>

AV is the average response for each attribute. The data under the ranking for each question is the number of responses received at that level.

**DEVELOPMENTS IN EUROPEAN ACCREDITATION**

The EUR-ACE project [15], launched in September 2004 intends to provide a European-wide accreditation system. It will develop a “commonly accepted European framework for conducting accreditations on a set of agreed procedures and quality input and output criteria for first and second-cycle engineering programs at HEIs and discuss the characteristics, common elements, and comparative advantages of their respective national procedures and criteria of accrediting engineering study programs.”
It dovetails into the wider European Higher Education Area framework evolving through the Bologna Declaration and has the potential to operate across many countries and regions through development of the present FEANI Index. The target is to carry out accreditation visits during 2006 and to award the first EUR-ACE “label” in December 2006. Ireland and Germany are signatories to the WA and would become part of EUR-ACE. It seems wise at this point in time for the WA to use this base to seek a significant role within EUR-ACE over the next 1 - 2 years.

**CHALLENGES FOR THE FUTURE**

**Global Core Attributes**

The trend toward the internationalisation of engineering education is accelerating via mechanisms such as the Western Hemisphere Initiative, Bologna Declaration, FEINA and EUR-ACE. The Washington Accord has served its members well and will no doubt continue to do so while also growing in membership. The challenge to the nations represented by signatory membership of the WA is not to be left behind in this race to internationalize the accreditation of engineering programs by standardizing graduate/program outcomes. It would serve the WA and its members well for it to play a role in the development of some core graduate attributes that would be recognized globally.

**Linking National to Global Core Attributes**

For the WA to remain a strong contender for setting these international accreditation benchmarks it must grow quickly to include more cross-regional members and maintain a high international profile and influence. The WA remains a model that is ideal for ongoing development as it is based largely on graduate outcomes. The outcomes in turn can be verified by local or national accreditation bodies who ensure that internal quality control processes exist to reinforce the overarching quality assurance models. ABET’s maintenance of specified proficiency requirements in its accreditation criteria is one evidence that complete reliance on outcomes is not sufficient for all engineering education programs.

**SUMMARY**

International developments surrounding the accreditation of engineering programs are occurring very quickly as illustrated by the Bologna Declaration and the ensuing and related meetings in Europe (EUR-ACE). Similarly the Western Hemisphere Initiative looks to play an important role in the Americas and surrounding regions. The Asia and Pacific region has to date largely relied on the Washington Accord as a means of mutual recognition of accreditation processes.

The international trend in accreditation of engineering programs has been to move away from specification of program content to specifying graduate outcomes. In some cases however, some individual professionals becoming concerned that this trend, which has also been challenged by some registration bodies. If necessary any excessive loss of technical content and basic engineering science can be addressed by maintaining specified proficiency requirements for accreditation.

Linking local to global core attributes appears to be a logical step in the internationalization of engineering. An explicit mapping process supported by external validation helps support a school’s claims that its programs are truly international. This validation by employers, accreditors and the profession links graduates into the global engineering market. Given the magnitude and scope of developments in Europe and Americas in borderless engineering education and accreditation the WA cannot stand still. The membership of the Washington Accord must be expanded and it should seek to play a leading role in development of globally recognized graduate attributes.

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**REFERENCES**


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