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Moving Towards International Engineering Program Recognition and Accreditation for Latin America and the Caribbean

María M. Larrondo Petrie, PhD

Florida Atlantic University, 777 Glades Road SE-308, Boca Raton, Florida 33431-0991 USA

petrie@fau.edu

Abstract

Latin American and Caribbean (LAC) universities are lagging behind attaining international recognition of their engineering programs. Many LAC countries have not recognized the need for accrediting their engineering programs. In 1989, the Washington Accord, a multinational agreement between Australia, Canada, Ireland, New Zealand, United Kingdom and the U.S.A. (Hong Kong joined in 1995, South Africa in 1999, and Germany, Malaysia and Singapore are Provisional Signatories), was signed recognizing accreditation systems and the engineering education programs they accredit, and also recognizing that graduates of programs accredited by the accreditation organizations of each member nation are prepared to practice engineering at the entry level. The Sydney Accord, signed in 2001 by Australia, Canada, Hong Kong, South Africa, and New Zealand, recognizes Engineering Technology programs. In 1990, the American Board of Engineering and Technology, ABET, started awarding *substantial equivalency* recognition to programs outside of the U.S., but only five Latin American or Caribbean institutions have engineering programs that have achieved international recognition: the Pontificia Universidad Católica de Chile, five campuses of the Instituto Tecnológico y de Estudios Superiores de Monterrey in Mexico, the Universidad Autónoma de Nuevo León in Mexico, and in Puerto Rico: the Universidad de Puerto Rico – Recinto Mayaguez and the Universidad Politécnica de Puerto Rico. This paper discusses the process of attaining substantial equivalency and expands on earlier work by the author to apply the Capability Maturity Model (CMM) to engineering education to provide five steps to facilitate engineering education process improvement and the required infrastructure to move toward accreditation and recognition of engineering program in Latin America and the Caribbean. The role that the Latin American and Caribbean Consortium of Engineering Institutions (LACCEI) could play in this critical need area is explored.

Keywords

Engineering Program Accreditation, Engineering Program Recognition, Washington Accord, Sydney Accord, Latin America, Caribbean, Accreditation, Capability Maturity Model.

1. Introduction

With today's emphasis on the “Global Engineer” and the increase in multi-national engineering projects, it is critical that an engineer be a graduate of an internationally recognized program. Many countries have established national accrediting agencies for engineering programs, which

permit graduates from these accredited programs to practice engineering at the entry level in that country. The need for international recognized programs has been acknowledged by many countries, which have signed international accords for mutual recognition. The multi-national accords recognize engineering accreditation systems from the signatory countries and the engineering education programs they accredit, and also recognizes that graduates of programs accredited by engineering accreditation organizations of each member nation are prepared to practice engineering at the entry level. There is now an International Register of Professional Engineers. However, no country of Latin America nor the Caribbean has signed any of the mutual recognition accords, nor is part of the organizations that govern the International Register. This absence limits the ability of Latin American and Caribbean engineers from being players globally and decreases their mobility and opportunities.

This paper looks at the importance of engineering program recognition to Latin America and the Caribbean, lists those programs and institutions that have attained this recognition, discusses the procedure of attaining recognition, and proposes a five step process to facilitate accreditation that is based on the Capability Maturity Model. The paper concludes by exploring the possible role that the Latin American and Caribbean Consortium of Engineering Institutions (LACCEI) could play in this critical need area.

2. Why International Recognition is Crucial for Engineering Programs in Latin America and the Caribbean?

The globalization of engineering projects and the economy in general, makes the international recognition of the engineering programs in Latin American and Caribbean (LAC) critical to the economy of this hemisphere. With the tightening of the US issuance of visas, there is a decrease in enrollment in graduate enrollment in the US. This provides increased opportunities for Latin American and Caribbean students. International recognition of their engineering program would allow LAC students to successfully compete for scholarships, fellowships, graduate assistantships, and practice as a Professional Engineer, a Chartered Engineer, an Engineer-In-Training (EIT), or an Engineering Technician.

3. The International Accords and Organizations to Recognize Engineering Programs

This section looks at the accords and organizations that have been signed and formed specifically to recognize engineering programs across national borders.

3.1 Fédération Européenne d'Associations Nationales d'Ingénieurs (FEANI)

As early as 1951, Europe acknowledged the need to recognize engineering programs and facilitate the mobility of engineers by forming the Fédération Européenne d'Associations Nationales d'Ingénieurs (FEANI) to:

- Secure the recognition of European engineering titles and to protect those titles in order to facilitate the freedom of engineers to move and practice within and outside Europe.
- Safeguard and promote the professional interests of engineers.

- Foster high standards of education and professional practice and regularly review them.
- Promote cultural and professional links within the engineering profession, especially in Europe.

FEANI has its headquarters in Brussels, and has currently National Member organizations from most countries in Europe, including all 15 European Union Member States. FEANI maintains an Index of courses at higher education institutions in its 25 member countries as well as those in France and Norway. These courses are recognized by FEANI as fulfilling the education requirements for the European Engineer (EUR ING) title. The Index also contains brief descriptions of the education systems of these countries. The Index contains approximately 14,000 engineering courses, each of which details its title, award and duration. The Index can be purchased on CD-ROM from FEANI. More information including how to purchase the Index CD-ROM can be found at www.feani.org/euring.html#Purchase. The official languages of FEANI are English, French and German.

Engineers having educational qualifications and a further period of professional experience making a total of seven years from the beginning of their higher education may apply for the title European Engineer, abbreviated as EUR ING, and be entered on the FEANI Register. The UK Privy Council has approved the use of the title EUR ING as a pre-nominal, in front of the name and before all other ranks and titles. It does not replace the title Chartered Engineer (CEng), which should still be used as a post-nominal.

3.2 International Register for Professional Engineers

Engineering today requires the engineer to be mobile and global in their vision and training. In 2002, the International Register of Professional Engineers (IRoPE) was formed, which is governed by the Engineer's Mobility Forum and Engineering Technologists' Mobility Forum, consisting of national engineering organizations of Australia, Canada, Hong Kong, Ireland, Japan, Korea, Malaysia, New Zealand, South Africa, United Kingdom and United States of America. This register is open to engineers who:

1. are licensed for independent practice within their own economy,
2. have an academic qualification equivalent to an accredited degree,
3. have seven years post-graduation experience,
4. have spent at least two years in significant engineering practice
5. are maintaining relevant continuing professional development at a satisfactory level

The second requirement greatly limit Latin American and Caribbean engineers from being players globally and decrease their mobility and opportunities.

3.3 The Washington Accord for Engineering Program Recognition

In 1989, the Washington Accord, a multinational agreement between Australia, Canada, Ireland, New Zealand, United Kingdom and the U.S.A. (Hong Kong joined in 1995, South Africa in 1999, and Germany, Malaysia and Singapore are Provisional Signatories), was signed recognizing accreditation systems and the engineering education programs they accredit, and also recognizing that graduates of programs accredited by the accreditation organizations of each

member nation are prepared to practice engineering at the entry level. Table 1 summarizes the national agencies that signed the Washington Accord

Table1. Signers of the Washington Accord to Recognize Engineering Programs

COUNTRY	SIGNER OF WASHINGTON ACCORD
Australia	The Institution of Engineers, Australia (IEAust) Association of Professional Engineers, Scientists and Managers, Australia (APESMA)
Canada	Canadian Engineering Accreditation Board (CEAB)
Hong Kong	The Hong Kong Institution of Engineers (HKIE)
Ireland	The Institution of Engineers of Ireland (IEI)
New Zealand	The Institution of Professional Engineers, New Zealand (IPENZ)
South Africa	The Engineering Council of South Africa (ECSA)
United Kingdom	Engineering Council United Kingdom (ECUK)
United States of America	Engineering Credentials Evaluation International of the American Board of Engineering and Technology (ECEI of the ABET)
PROVISIONAL SIGNATORIES	
Germany	
Malaysia	
Singapore	

Note that no Latin American nor Caribbean country has signed the Washington Accord.

3.5 Bologna Declaration

The more general Bologna Declaration was signed originally by the Education Ministers of 29 European countries in June 1999. Since then participation has expanded, so that 40 countries are now signatories. Its goal was to create a European Higher Education area, through achieving the following six objectives, by 2010:

1. Adoption of a system of easily readable and comparable degrees
2. Adoption of a system essentially based on two main cycles, undergraduate and graduate
3. Establishment of a system of credits
4. Promotion of mobility for students and staff
5. Promotion of European co-operation in quality assurance
6. Promotion of European dimensions in Higher Education

No equivalent agreement exists for Engineering Programs or Higher Education programs in this hemisphere.

3.6 The Sydney Accord for Engineering Technology Program Recognition

The Sydney Accord, signed in 2001 by Australia, Canada, Hong Kong, South Africa, and New Zealand and the United Kingdom, recognizes engineering programs accredited at the Incorporated Engineer level by the signators. It operates similar to the Washington Accord. Table 2 summarizes the signers of the Sydney Accord. Again Latin American and Caribbean countries are not participating in this opportunity to increase the opportunities and mobility for their engineering technologists.

Table 2. Signers of the Sydney Accord to Recognize Engineering Technology Programs

COUNTRY	SIGNER OF SYDNEY ACCORD
Australia	The Institution of Engineers, Australia (IEAust)
Canada	The Canadian Council of Technicians and Technologists (CCTT)
Hong Kong	The Hong Kong Institution of Engineers (HKIE)
Ireland	The Institution of Engineers of Ireland (IEI)
New Zealand	The Institution of Professional Engineers, New Zealand (IPENZ)
South Africa	The Engineering Council of South Africa (ECSA)
United Kingdom	Engineering Council United Kingdom (ECUK)

3.7 The Dublin Accord for Engineering Technician Programs

In May 2002 the national engineering organizations of Canada, Ireland, South Africa and the United Kingdom signed an agreement mutually recognizing the qualifications that underpin the granting of Engineering Technician titles in the four countries. Table 3 shows the signatories. Operation of the Accord is the same as the Washington and Sydney Accords.

Table 3. Signers of Sydney Accord to Recognize Engineering Technicians Qualifications

COUNTRY	SIGNER OF SYDNEY ACCORD
Canada	The Canadian Council of Technicians and Technologists (CCTT)
Ireland	The Institution of Engineers of Ireland (IEI)
South Africa	The Engineering Council of South Africa (ECSA)
United Kingdom	Engineering Council United Kingdom (ECUK)

3.8 Sistema Hemisférico de Capacitación para el Desarrollo Agrícola – Hemispheric Training System for Agricultural Development (SIHCA)

The Sistema Hemisférico de Capacitación para el Desarrollo Agrícola – Hemispheric Training System for Agricultural Development (SIHCA), based in Venezuela, has a hemispheric vision for education and has web pages in Spanish, English, Portuguese and French. The organization was formed in collaboration with The Instituto Interamericano de Cooperación para la Agricultura – Interamerican Institute for Cooperation in Agriculture (IICA), Organization of American States (OAS), the World Bank Group, and INDER/CIARA.

This type of organization that encompasses engineering at a hemispheric level of accreditation may be the desired ultimate goal. The dissemination of information in the prominent languages in this hemisphere is critical. An organization that has hemispheric focus would diminish the focus on Latin America and the Caribbean, which is far behind Canada and the U.S.A. in issues of accreditation. This author believes that an organization with the focus on Latin America and the Caribbean, which distributes information in Spanish, English, Portuguese and French, and focuses in bringing the organizations that accredit in these countries to be recognized under the Washington Accord is what is called for at this time. The Latin American and Caribbean organizations do not consistently use the internet to disseminate information and this makes finding information about engineering accreditation and accreditation in general in this region very difficult.

3.9 UNESCO's Instituto Internacional para la Educación Superior en América Latina y el Caribe - International Institute for Higher Education in Latin America and the Caribbean (IESALC)

UNESCO's Instituto Internacional para la Educación Superior en América Latina y el Caribe ‘ International Institute for Higher Education in Latin America and the Caribbean (IESALC) (E-mail: iesalc@unesco.org.ve Website: <http://www.iesalc.unesco.org.ve>, Address: Apartado 68 394, Caracas 1062-AVenezuela, Tel: +58 212 286 10 20, Fax: +58 212 286 03 26) was formed with the mission to promote the development and renewal of higher education in Latin America and the Caribbean so that it will have the necessary quality, capacity and relevancy for meeting the region's present and future needs, and for supporting a culture of peace and sustainable human development. The Institute carries out its mission mainly by acting as an observatory, tracking and analyzing trends, and by promoting research and reform, and information exchange. Most of all, it generates cooperation among universities, including the creation of specialized networks of experts, academics and governmental and non-governmental organizations at national, regional and international levels. Its activities (IESALC) fall into the following areas:

- ***Regional trends in higher education***

IESALC prepares national and regional reports on trends in higher education in Latin America and the Caribbean. A major concern is to ensure that higher education supports the overall goals of Education for All, and takes into account regional, national and local priorities. Examples of this work include:

- a study on the situation and perspectives of higher education in 12 English-speaking Caribbean countries, with a follow-up regional workshop (Nassau, Bahamas, 2002)
 - 14 national studies analyzing the effects of female enrolment in higher education, with a regional seminar to inform public policy formulation
 - studies and seminars examining the impact of migration of Latin American and Caribbean academics to other countries and
 - a specialized advisory network launched to promote intercultural participation in indigenous higher education in the region.
- ***Institutional reform and curriculum change***
IESALC promotes research on legislative issues and reform, and on the management and evaluation of universities, especially Latin American macro-universities (consortia of universities, research groups and related institutions). It aims to generate policies to improve governance, funding, quality and access. To this end, the Institute has:
 - conducted a regional study of 20 macro-universities in Latin America;
 - held the 1st Rectors' meeting of Latin American macro-universities (Caracas, 2002); and
 - launched a cooperative network of 29 public universities.
 - ***Evaluation and accreditation systems***
IESALC played a major role in establishing the Ibero-American Network for the Evaluation and Accreditation of Quality of Higher Education (RIACES) in 2003. In coordination with RIACES, the Institute is also working on a project to develop self-evaluation software.
 - ***Information and communication technologies***
IESALC is examining how virtual universities can strengthen the quality and pertinence of higher education, as well as international cooperation and interchange and how they can be coordinated with other forms of higher education. For example, the Institute:
 - has done analytical studies of national trends in ICT use in higher education; and
 - conducted a regional seminar (Quito, 2003) to formulate proposals for developing virtual education and the use of new technologies in higher education.
 - ***International cooperation***
In the context of globalization and regionalization, the cross-border delivery of education (distance courses), new educational providers (for example, e-learning companies) and international mobility of professionals are becoming increasingly important issues for IESALC, especially the impact this has on the region. In this domain, the Institute has:
 - prepared and published the study *New Providers, Transnational Education and Higher Education Accreditation* (2002); and
 - conducted a regional study on internationalization of higher education in the Caribbean.
 - ***Information and documentation***
IESALC has set up its own portal, providing news about higher education and documentation and analysis generated by the region's research centers. The Institute:
 - publishes the *Digital Bulletin of Higher Education*, covering important news and debates in higher education;
 - offers a wide range of publications, documents and reference works through its Information and Documentation Service; its online catalogue provides 11,622 bibliographic entries and 2,500 analytical summaries of recent monographs;
 - promotes university presses; and
 - aims to create an online statistical system of university information.

3.9.1 UNESCO's Ibero-American Network for the Evaluation and Accreditation of Quality of Higher Education – Red Iberoamericana para la Acreditación de la Calidad de la Educación Superior (RIACES)

UNESCO's IESALC played a major role in establishing the Ibero-American Network for the Evaluation and Accreditation of Quality of Higher Education RED IBEROAMERICANA PARA LA ACREDITACIÓN DE LA CALIDAD DE LA EDUCACIÓN SUPERIOR (**RIACES**) (RIACES) in 2003 in Buenos Aires and assembled in 2004 in Havana, Cuba. The mission of RIACES is to promote among Ibero-American countries cooperation and interchange of resources for evaluation and accreditation of university programs, and to contribute to the guarantee of quality in this region. RIACES members are the official organizations charged with accreditation and evaluating institutional quality. For each nation, this could be either a governmental accrediting agency at the national level or an institution recognized competent to fix the policies in higher education for a program area, or a sub-regional organization officially recognized as a competent authority in higher education quality assessment and accreditation. In coordination with RIACES, the UNESCO's IESALC is also working on a project to develop self-evaluation software. RIACES has a web portal: <http://www.riaces.org>, where information of the members, resources available, activities and information of interest to higher education can be found in Spanish.

RIACES has gathered documents describing the mechanism used for accreditation in various Ibero-American Nations. Only one document currently on this web site is relevant to engineering accreditation:

- Argentina – Comisión Nacional de Evaluación y Acreditación Universitaria (CONEAU) “Guía de Autoevaluación. – Ingeniería” (CONEAU, 2002) – explains accreditation process for the different stages of engineering professions: auto-evaluation, actuation of the pairs committee, and CONEAU analysis and decisions.

3.10 Organization of Ibero-American States for Education, Science and Culture – Organización de Estados Iberoamericanos para la Educación, las Ciencias y la Cultura (OEI)

The Organización de Estados Iberoamericanos para la Educación, las Ciencias y la Cultura (the Organization of Ibero-American States for Education, Science and Culture) (OEI) is an associate member of RIACES. It fosters international cooperation in education among Ibero-American countries. It publishes the *Revista Iberoamericana de Educacion*. A list of iberoamerican educational journals and magazines with link to their web sites is available at from PlanetaOnline.Com web site: <http://lamira.com/Educacion/Revistas/index.shtml>

3.11 Mercosur

In 1995, the economic bloc, called Mercosur (Brito, 2003), involving Brazil, Argentina, Paraguay and Uruguay, looks at the social, political and economic concerns of these four countries in the South Cone of this hemisphere. These countries align themselves to improve the

quality of goods and services and leverage to achieve lower costs. A free market between these four countries is planned beginning 2006. Recently the four countries adopted that both Spanish and Portuguese will be taught in each of the four countries. This brings this region a step closer to globalization. In the future it will consider a wider integration in many levels, including similar educational systems. Currently there is an experimental mechanism of professional title recognition, called MEXA (Mecanismo Experimental de Carreras), for recognizing degrees from academic programs in member countries and associates of Mercosur, in the fields of agronomy, engineering and medicine. Chile's accrediting agency, Comisión Nacional de Acreditación (CNAPE) lists 5 programs, all in agronomy, that have received Mercosur accreditation in Chile, which are listed in Table 4.

Table 4. Chilean Professional Programs Accredited by Mercosur
[year accreditation expires]

Country	University	Program
Chile	Universidad de Concepción	Agronomía [2009]
	Pontificia Universidad Católica de Valparaíso	Agronomía [2009]
	Universidad Austral de Chile	Agronomía [2009]
	Universidad de Chile	Agronomía [2009]
	Pontificia Universidad Católica de Chile	Agronomía [2009]

3.12 L'Association des Universités Partiellement ou Entièrement de Langue Française - Association of Francophone or Partially Francophone Universities (AUPELF)

In 1961, the L'Association des Universités Partiellement ou Entièrement de Langue Française - Association of Francophone or Partially Francophone Universities (AUPELF) was formed in Montréal to foster cooperation in development of educational materials for programs in higher education. It is funded by Fonds International de Coopération Universitaire (FICU).

3.12.1 L'Université des Réseaux d'Expression Française (UREF)

In 1987, the general assembly of AUPELF created the intergovernmental organization L'Université des Réseaux d'Expression Française (UREF) to support scientific projects across Francophone institutions of higher education. Francophone institutions of higher learning and research centers can receive funding for collaboration and joint projects by becoming members of AUPELF-UREF. In 1994, it started to receive funding by Fonds Francophone de la Recherche (FFR), providing multilateral financing to support southern Francophone countries with the support of northern Francophone countries.

In 1996, the Francophone Chief of States approved funds for the Francophone Universitaire de L'Information (FFI), which funded programs to support information technology and scientific information; the Fonds Francophone Universitaire de la Formation (FFF), which funded bilingual education; and Fonds l'Enseignement Supérieur (FRES), which funded international student exchange and collaboration among Francophone institutions. In 1998, they funded the Université Virtuelle Francophone (UVF), which began a virtual university with programs in French..

3.13 Latin America an Caribbean Consortium of Engineering Institutions (LACCEI)

Although the OEI and AUPELF address programs taught in French, and facilitates dissemination of information and collaboration within the Ibero-American institutions and within Francophone institutions Universities, there does not seem to be one organization that joins all Latin American and Caribbean educational institutional, specifically needed is an organization that will facilitate accreditation and program recognition in engineering in this area, which is made difficult by the different language spoken in this hemisphere.

In 2001, the Latin American and Caribbean Consortium of Engineering Institutions (LACCEI) was formed and held its first conference in the Dominican Republic. Its mission is to be the leading organization of Latin American and Caribbean engineering institutions that will bring innovations in engineering education and research, and emerge as a major force in this hemisphere to foster partnerships among academia, industry, government and private organizations for the benefit of the society and the nations.

The goals and objectives of LACCEI are cooperation and partnerships among member institutions in the areas of engineering education, research, and technology advancement with emphasis on:

- Faculty and student exchange
- New and/or higher level academic programs
- Dual/joint degree and certificate programs
- Distance, continuing and e-education
- Laboratory development and sharing of resources
- Curriculum development, course equivalency and accreditation support
- Faculty development including higher degrees
- Industry internship, cooperative programs and career development
- Joint training and research programs, and solicitation of funds
- Development, commercialization and transfer of technology
- Dissemination of scholarly achievements and other accomplishments by member institutions.

Several dual and joint degree programs have been achieved through LACCEI. The dual degree programs give the student a degree from their home institution, permitting them to practice as professional engineers in their home country; and a degree from the United States, which allows them to practice also as a professional engineer in the USA; or a degree from Spain, which allows them to practice as a professional engineer in any country in the European Union. The first step of achieving a dual degree program is the homologation of courses between the two

universities. In Florida, all public universities are homologated, so homologating with one Florida university will facilitate homologating to others. Homologation includes the documentation of a standards number of hours in lectures and in laboratories, and 80% of common materials. Homologating to an ABET accredited programs moves the Latin American or Caribbean program closer to program recognition and accreditation. Puerto Rico is an Ibero-American country that enjoys special privileges with the USA, including educational subsidies from the USA and some of their universities have attained ABET accreditation for engineering programs and are also members of LACCEI. A panel in this conference (Pagan-Trinidad, 2005)

3.14 Asociación Iberoamericana de Instituciones de Enseñanza de la Ingeniería – Iberian American Association of. Engineering Education Institutions (ASIBEI)

Asociación Iberoamericana de Instituciones de Enseñanza de la Ingeniería - Iberian American Association of. Engineering Education Institutions (ASIBEI) tiene dos publicaciones *Cultura, Profesión y Acreditación del Ingeniero Iberoamericano* y *Situación Actual de la Acreditación de Programas de Ingeniería en Iberoamérica*, que se encuentran en el web.

3.15 Ibero American Science & Technology Education Consortium (ISTEC)

Another Iberian American consortium that casts a wider net than those listed above is the Ibero American Science & Technology Education Consortium (ISTEC). Created in 1990, its mission is to foster scientific, engineering and technology education, joint international research and development efforts among members, and to provide a cost-effective vehicle for the application and transfer of technology. It has academic, industry and initiative members, and a strong list of Industry Partners. It has an Annual Assembly usually held in November or December every year. Some information on grants, scholarship, student exchanges and fellowship is disseminated in its web pages, <http://www.istec.org/>. Very useful links to Ibero American organization of science and technology is also archived, and to digital libraries. A link found on this site, leads to LANIC – The Latin American Network Information Center, based in University of Texas – Austin (LANIC), which provides numerous links to organizations and institutions for this area, and provides information in English, Spanish and Portuguese.

It also supports the Argentine *Journal of Computer Science & Technology*, which is printed at the Universidad Nacional de La Plata in Argentina. It was not clear if there was an edition in Spanish.

Its most ambitious initiative, called Los Libertadores, seeks to create Centers of Excellence in each country or region to provide a flexible hemispheric network of telecommunication services for academic and research and development purposes, computing facilities and teaching stations. This is to include a Science and Technology Education Portal, STEP, and a distributed multilingual database. It also provides links to regional free software and manuals downloads.

Another initiative, the Advanced Continuous Education (ACE) is to provide a means of exchanging non-traditional training, such as distance learning programs.

3.16 National Engineering Organizations in Latin America and the Caribbean

At the national levels there are some countries with organizations for engineering schools and engineering faculties, such as Asociación Nacional de Facultades y Escuelas de Ingeniería – nacional Association for Faculties and Schools of Engineering (ANFEI) in México and the Asociación Colombiana de Facultades de Ingeniería – Colombian Association of Engineering Faculties (ACOFI) in Colombia.

3.16.1 Asociación Nacional de Facultades y Escuelas de Ingeniería – National Association for Faculties and Schools of Engineering (ANFEI)

At the national levels there are some countries with organizations for engineering schools and engineering faculties, such as Asociación Nacional de Facultades y Escuelas de Ingeniería – nacional Association for Faculties and Schools of Engineering (ANFEI) in México. Their web page information is very limited <http://www.anfei.org.mx/>, but they have been conducting an annual national conference *Conferencia Nacional de Ingeniería* for over 30 years. The Universidad Autónoma de Nuevo León publishes a bi-monthly journal since 1998 that is available online, called *Ingenierías*, at <http://ingenierias.uanl.mx/>.

3.16.2 La Asociación Colombiana de Facultades de Ingeniería – Colombian Association of Engineering Faculties (ACOFI)

The Asociación Colombiana de Facultades de Ingeniería – Colombian Association of Engineering Faculties (ACOFI) was founded in Bogotá, Colombia in 1975. Its mission is to promote quality activities, outreach, and research developed by Colombian engineering faculties or Colombian engineering programs. The listing of its member institutions provides links to the web site of 61 engineering institution of higher education in Colombia. ACOFI also has several publications of interest: *Actualización y Modernización Curricular en Ingeniería* (ACOFI, 1995) - Engineering Curricular Implementation and Modernization, *Programas de Ingeniería en Colombia* (ACOFI, 1999) – Colombian Engineering Programs, y *Declaración Pública sobre los Exámenes de Calidad de la Educación Superior - ECASES – Ingeniería 2003* (ACOFI, 2003) – Public Pronouncement on de Exams for Quality Higher Education – ECASES – Engineering 2003.

The information that ANFEI and ACOFI has maintained in their web pages impacts engineering program quality in México and Colombia, and unites most but not all the engineering institutions of higher education in these two countries. The Iberoamerican and Francophone organizations, such as ASIBEI and AUPELF, carry a wider net to include Portuguese, Spanish, and French speaking institutions. LACCEI's conference accepts papers in English, Spanish, Portuguese, and French, to be inclusive of all engineering institutions in Latin America and the Caribbean. Its web pages appear however only in English.

3.17 International Network for Quality Assurance Agencies in Higher Education (INQAAHE)

The INQAAHE: International Network for Quality Assurance Agencies in Higher Education. <http://www.inqaahe.org/> has Latin America and Caribbean members (see Table 4):

Table 4. List of Latin American and Caribbean Accrediting Agencies (INQAAHE)

Argentina	National Commission for Evaluation and Accreditation (CONEAU - Comision Nacional de Evaluacion y Acreditacion Universitaria) , Ministerio De Educaci3n, Ciencia Y Tecnologa - Rep3blica Argentina, Av. Santa Fe 1385 - Piso 4 (C1059ABH), Buenos Aires, Argentina Professor Victor Ren3 Nicoletti, Leandro E. Haberfeld (International Relations) leandroh@coneau.gov.ar http://www.coneau.gov.ar/
Bahamas	Quality Assurance Unit. The Bahamas Ministry of Education., Thompson Boulevard, Post Office Box N-3913/4, Nassau, N.P., The Bahamas Dr Linda Davis, Paula Sweeting-Davis, H. Joyce Thompson hjthompson@mail1.coralwave.com www.bahamas.gov.bs/bahamasweb/home.nsf
Chile	Comision Nacional De Acreditacion De Pregrado (CNAP - National Commission of Accreditation), Marchant Pereira 954, Providencia, Santiago, Chile Maria Jose Lemaitre del Campo mariajose.lemaitre@mineduc.cl www.cnap.cl Consejo Superior de Education, Marchant Pereira 844 Providencia, Rep3blica de Chile Jos3 Miguel Salazar Zegers consulta@cse.cl www.cse.cl
Colombia	Consejo Nacional de Acreditaci3n, Calle 19 No. 6-68 Piso 17, Bogot3, Colombia Guillermo Hoyos, ghoyos@cna.gov.co
Costa Rica	Central American Council of Accreditation of Higher Education (Consejo Centroamericano de Acreditaci3n de la Educaci3n Superior, CCA), From Office Depot, 100 mts. North and 75 mts. East, San Pedro de Montes de Oca, San Jos3, Costa Rica Licda. Marianela Aguilar Arce, Carlos T3nnermann Bernheim, President CCA cca@cariari.ucr.ac.cr www.ucr.ac.cr Sistema Nacional de Acreditaci3n de la Educaci3n Superior, SINAES, Edificio Mayra Alvarado Urtecho sinaes@conare.ac.cr www.conare.ac.cr
Guatemala	Consejo Superior Universitario Centroamericano (CSUCA), Avenida de las Americas 1-03, Club Los Arcos, zona 14, Ciudad de Guatemala, Guatemala Efra3n Medina Guerra, Francisco Alarcon Alba, Secretario General Adjunto y Director 3rea Acad3mica (Academic Areas Director), E-mail: falarcon@csuca.edu.gt emedina@csuca.edu.gt www.csuca.edu.gt

Jamaica	<p>The University Council of Jamaica (UCJ), 6B Oxford Road, Kingston 5, Jamaica Dr Ethley D. London ucjlondel@infochan.com www.ucjamaica.com/</p> <p>National Council on Technical and Vocational Education and Training - NCTVET, Box 179, Gordon Town Road, Kingston 6, Jamaica W.I. Jennifer Walker jennifer_walker@heart-nta.org heart-nta.org</p>
México	<p>Comisión Nacional para la Evaluación de la Educación Superior (CONAEVA), A. San Fernando No. 1, Col Toriello Gurerra, Tlalpan 14050, Mexico Dr Eugenio Cetina Vadillo</p> <p>Consejo para la Acreditación de la Educación Superior (COPAES), Av. San Jerónimo No. 120, Col. Jardines del Pedregal, Mexico D.F., 04500, Mexico Dr Hugo Aréchiga Urtuzuástegui director_general@copaes.org.mx www.copaes.org.mx</p>
Perú	<p>(Associate Member)</p> <p>Consortio de Universidades, Consorcio de Universidades, Plaza Francia 1164, Lima - Perú Dr Luis Eduardo Bacigalupo Caverro-Egúsqiza, Jessica Bendezu Flores, Secretaria, Consorcio de Universidades, Lima-Perú, Tel.: (51-1) 425-0422 // (51-1) 331-1857, Fax: (51-1) 331-2124, e-mail: jbendezu@consorcio.edu.pe bacigalupo@consorcio.edu.pe www.consorcio.edu.pe</p>
Trinidad and Tobago	<p>Committee on the Recognition of Degrees (CORD), 2A Alexandra Street, Port of Spain, Trinidad, W.I. Dr Alvin A. Ashton accredit@niherst.gov.tt www.niherst.gov.tt</p>

As Table 4 shows, there are many countries in Latin American and the Caribbean who may not have accrediting agencies for higher education, or have not taken the necessary steps to get international recognition for their accrediting agencies. The agencies included in Table 4, may accredit engineering institutions, such as Argentina's CONEAU; but this information is not readily available on the web.

3.18 National Organization of Faculties of Individual Engineering Disciplines

There are many organizations particular to individual engineering disciplines that have existed for many years and are well organized. For example, in Argentina the Red the Universidades Nacionales con Carreras en Informática – Network of National Universities with IT Programs, (RedUNCI), and in Perú CONFINI unites the Industrial Engineering faculties in the country. LACCEI arranged to have one of its Extended Governing Board meetings co-located with the annual CONFINI. LACCEI also presented to a paper regarding the need for international recognition of engineering programs to the American Society of Engineering Education, and the the Global Engineering Education Symposium in Beijing, China. By continuing this collaborating in this initiative, and working together as Affiliated Members, more information can be disseminated to more individuals critical to the recognition of the quality of engineering programs in Latin America and the Caribbean.

4. Substantial Equivalency – Only Recourse for non-signators

The APEC (Asia Pacific Economic Cooperation) economies are encouraged to set up bilateral agreements on reciprocal recognition of professional qualifications.

No Latin American nor Caribbean country signed either the Washington or the Sydney Accord or the Dublin Accord. No agreement equivalent to the Bologna Agreement or FEANI includes Latin American nor Caribbean countries. RIACES and OEI includes only Ibero-American countries and very limited process has been made in the area of engineering accreditation and program recognition. So how does an engineering institution from a Latin American or Caribbean country achieve international program recognition? In 1990, the American Board for Engineering and Technology, ABET, started awarding *substantial equivalency* recognition to programs outside of the U.S.

4.1. Procedure to Attain Substantial Equivalency

ABET has published guidelines for receiving accreditation (ABET, 2000), and for receiving Substantial Equivalency (ABET INTAC, 2005a, b, c). The International Activities Council (INTAC) of ABET has established processes for mutual recognition of ABET-accredited programs in the United States and corresponding programs in other countries, and to assist other higher education agencies or organizations outside the United States in developing continuous quality assurance processes. The first step in attaining recognition is to enter into a Mutual Recognition Agreement (MRA) with ABET and/or becoming a signatory of the Washington Accord. ABET can share its experience in the field of accreditation, general information on its policies and procedures, criteria development seminars, evaluator training, observer visits, and other related activities. This service exchange is formalized through a Memorandum of Understanding (MOU) (ABET INTAC, 2005a) with appropriate higher education agencies or agencies or organizations in other countries to promote continuing improvement of applied science, computing, engineering, and technology education.

To be considered for entering into a MOU with ABET INTAC, an organization must

1. have established or be seeking to establish a profession-controlled, peer-reviewed accreditation system for applied science, computing, engineering, or technology degree programs at institutions of higher education within their country,
2. have received recognition, approval, and/or authorization of operating status from a national educational ministry, legislative mandate or other appropriate governmental or non-governmental authority,
3. provide a governance structure that includes representation of the professions related to the programs to be accredited, and involve professional peers in the accreditation process, including formulation of accreditation criteria, policies and procedures, and decisions about accreditation actions, and
4. recognize and agree that ABET may enter into other MOUs with other entities within the same country or region when judged appropriate by ABET.

The MOU has the following restrictions:

1. The organization must have or commit to establish educational quality assurance goals, objectives, criteria, policies, and procedures that are consistent with ABET practice.
2. The organization will share studies, proposals, discussions, minutes of board/commission meetings, and accreditation policies and procedures; and agree to participate as observers in meetings and site visits and contribute to the understanding of each other's system of accreditation.
3. Any financial commitment related to the MOU must be specified in writing. All activities engaged in by ABET related to the implementation of MOUs must be cost neutral to ABET.
4. Any evaluations or consultations related to the MOU will be completed in accordance with established ABET policies and procedures. Different economic, cultural, environmental, political, societal factors and technical and educational matters will be taken into consideration.

Expensive. In 2005-2006, ABET charges \$6250 base fee for a campus consultation visit independent of the number of programs evaluated plus \$1875 per day for each consultant plus travel expenses.

For evaluation for Substantial Equivalency a base charge for a campus visit of \$7,500 is charged, plus a fixed fee of \$7,500 for evaluator for each program beyond the team chair, plus travel costs. If more than one location must be visited a charge of \$625 for each off-campus location plus any travel costs incurred.

5. Latin American and Caribbean Engineering Programs deemed Substantially Equivalent

In 1990, ABET started awarding *substantial equivalency* recognition to programs outside of the U.S. The guidelines and procedures for obtaining the equivalency have been specified. Fifteen years after this facility was started, one would expect a large number of Latin American and Caribbean institutions to have completed the process, but Table 5 shows that basically only 4 institutions in 3 Latin American or Caribbean countries have successfully completed this process.

Table 5. Substantially Equivalent Latin American and Caribbean Engineering Programs
[year of accreditation]

Chile	Pontificia Universidad Católica de Chile, Santiago, Chile Chemical Engineering [2003] Civil Engineering [2003] Computer Engineering [2003] Electrical Engineering [2003] Mechanical Engineering [2003]
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México	<p>Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM)</p> <p>ITESM – Campus Monterrey, Monterrey, México Chemical & Industrial Engineering [1992] Chemical & Systems Engineering [1992] Civil Engineering [1992] Computer Systems Engineering [2001] Electronics & Communications Engineering [1992] Industrial & Systems Engineering [1992] Mechanical & Electrical Engineering [1992] Mechanical & Industrial Engineering [1992]</p> <p>ITESM – Campus Ciudad México, México D.F., México Electronics & Communications Engineering [2003] Industrial & Systems Engineering [2003] Mechanical Engineering [2003]</p> <p>ITESM – Campus Estado de México, México D.F., México Electronics & Communications Engineering [2002] Electronics & Computer Engineering [2002] Industrial & Systems Engineering [2002] Mechanical Engineering [2002]</p> <p>ITESM – Campus Querétaro, Querétaro, México Computer Systems Engineering [1993] Electronic Systems Engineering [1993] Electronics & Communications Engineering [1993] Industrial & Systems Engineering [1993] Mechanical & Industrial Engineering [1993]</p> <p>ITESM – Campus San Luís Potosí, San Luís Potosí, México Industrial and Systems Engineering [2004]</p> <p>Universidad Autónoma de Nuevo León, San Nicolás de los Garza, México Civil Engineering [2004]</p>
Puerto Rico	<p>Universidad de Puerto Rico – Mayagüez, Mayagüez, Puerto Rico Chemical Engineering [1970] Civil Engineering [1960] Computer Engineering [1994] Electrical Engineering [1960] Industrial Engineering [1970] Mechanical Engineering [1960]</p> <p>Universidad Politécnica de Puerto Rico, San Juan, Puerto Rico Civil Engineering [1996] Electrical Engineering [1996] Environmental Engineering [2002] Industrial Engineering [1996] Mechanical Engineering [1996]</p>

5. Need for Latin American and Caribbean Accrediting Bodies for Engineering Programs

Table 6 shows a table of the national accrediting bodies for engineering educational programs, note that no Latin American nor Caribbean agencies are listed! Without international recognition of the engineering accrediting agencies that exist, how can the LAC engineer compete in today's global economy and take advantage of educational opportunities?

Table 6. National Accrediting Bodies for Engineering Programs

Australia	The Institution of Engineers, Australia <i>Signatory to Washington & Sydney Accords, APEC Engineers Register and Engineers Mobility Forum (International Register of Professional Engineers)</i>
Bangladesh	Institution of Engineers Bangladesh <i>Provisional signatory to Engineers Mobility Forum (International Register of Professional Engineers)</i>
Canada	The Canadian Council of Professional Engineers <i>Signatory to Washington Accord, APEC Engineers Register and Engineers Mobility Forum (International Register of Professional Engineers). Contains links to Provincial member organizations.</i> The Canadian Council of Technicians and Technologists <i>Signatory to Sydney Accord. Contains links to Provincial member organizations.</i>
France	Conseil National des Ingenieurs et des Scientifiques de France <i>French professional engineers organisation</i> Commission des Titres D'Ingenieur <i>French engineering courses accreditation body</i>
Germany	Accreditation Agency for Study Programs in Engineering, Informatics, Natural Sciences, and Mathematics (ASIIN) <i>Provisional signatory to Washington Accord</i> Verein Deutscher Ingenieure (VDI) <i>The Association of Engineers</i> Verband der Elektrotechnik Elektronik Informationstechnik (VDE) <i>The Association for Electrical, Electronic & Information Technologies</i>
Hong Kong-China	The Hong Kong Institution of Engineers <i>Signatory to Washington & Sydney Accords, APEC Engineers Register and Engineers Mobility Forum (International Register of Professional Engineers)</i>
India	National Board of Accreditation <i>Indian technical subjects accreditation body</i> Institution of Engineers of India <i>Provisional signatory [with Engineering Council India] to Engineers Mobility Forum (International Register of Professional Engineers)</i>
Indonesia	The Institution of Engineers, Indonesia <i>Signatory to APEC Engineers Register</i>
Ireland	The Institution of Engineers of Ireland <i>Signatory to Washington, Sydney & Dublin Accords, and Engineers Mobility Forum (International Register of Professional Engineers); member of FEANI</i>
Italy	Consiglio Nazionale Ingegneri <i>Member of FEANI</i>
Japan	Japan Accreditation Board for Engineering Education <i>Provisional signatory to Washington Accord</i> Institution of Professional Engineers Japan <i>Signatory to APEC Engineers Register and Engineers Mobility Forum</i>

Japan (cont.)	<i>(International Register of Professional Engineers)</i>
Korea	Korean Professional Engineers Association <i>Signatory to APEC Engineers Register and Engineers Mobility Forum (International Register of Professional Engineers)</i>
Malaysia	Board of Engineers Malaysia <i>Provisional signatory to Washington Accord</i> Institution of Engineers Malaysia <i>Professional engineering institution</i>
New Zealand	The Institution of Professional Engineers, New Zealand <i>Signatory to Washington & Sydney Accords, APEC Engineers Register and Engineers Mobility Forum (International Register of Professional Engineers)</i>
Pakistan	Pakistan Engineering Council
Russia	Russian Association for Engineering Education Accreditation Board
Singapore	Institution of Engineers Singapore <i>Provisional signatory to Washington Accord</i> Professional Engineers Board <i>Professional Engineers registration body</i>
South Africa	The Engineering Council of South Africa <i>Signatory to Washington, Sydney & Dublin Accords, and Engineers Mobility Forum (International Register of Professional Engineers)</i>
Sri Lanka	Institution of Engineers Sri Lanka
Thailand	Thai Professional Engineering Board <i>Signatory to APEC Engineers Register</i>
United Kingdom	Engineering Council of the United Kingdom (ECUK) <i>Signatory of the Washington Accord and Sydney Accord</i>
USA	The Accreditation Board for Engineering & Technology <i>Signatory to Washington Accord</i> National Council of Examiners for Engineering and Surveying <i>Contains details of Licensure Examinations and links to all State Licensing Boards</i> United States Council for International Engineering Practice <i>Signatory to APEC Engineers Register and Engineers Mobility Forum (International Register of Professional Engineers)</i>
Other Engineering Federation Organizations	
Europe	FEANI <i>Pan-European Federation of National Engineering Associations, with links to and contact details of its 25 national member bodies</i> EurEta <i>The European Higher Engineering and Technical Professionals Association</i> SEFI <i>European Society for Engineering Education</i>
Outside Europe	APEC <i>Asia Pacific Economic Cooperation</i> CEC <i>Commonwealth Engineers Council</i> Washington Accord <i>International mutual recognition agreement of accredited professional engineering programmes</i> WFEO <i>World Federation of Engineering Organisations</i>

6. Taking Small Steps Toward Accreditation

In earlier papers (Larrondo Petrie, 2004a, 2004b, 2004c), this author presented the idea of applying accepted process improvement models to the accreditation and engineering educational program recognition process.

6.1 The Capability Maturity Model (CMM)

The proposed model is based on the five-level engineering process improvement model, called the Capability Maturity Model (CMM) (SEI, 1995) that measures an organization's *process capability*, the inherent ability of a process to produce planned results. As the process capability increases, the results become predictable and measurable, and the most significant causes of poor quality and productivity are controlled or eliminated. The success, acceptance and maturation of the CMM prompt a closer look at their potential application to improve the process of engineering education.

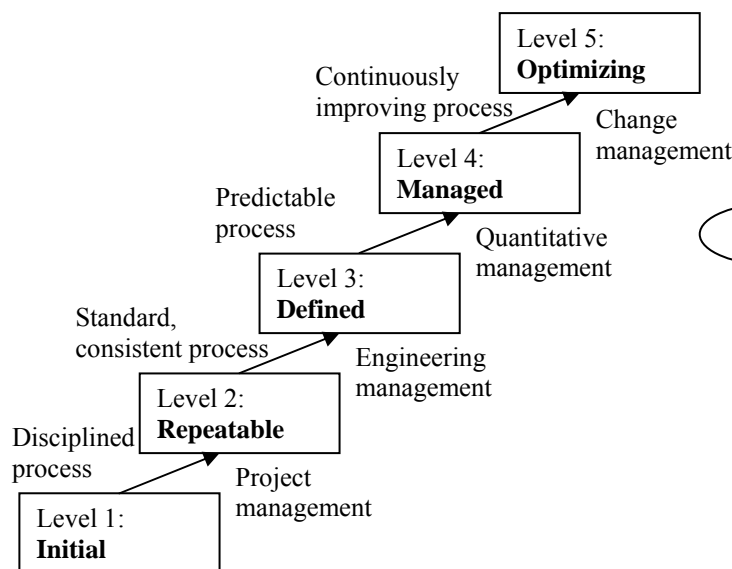


Figure 1: The Five Stages or Maturity Levels of the Capability Maturity Model [5]

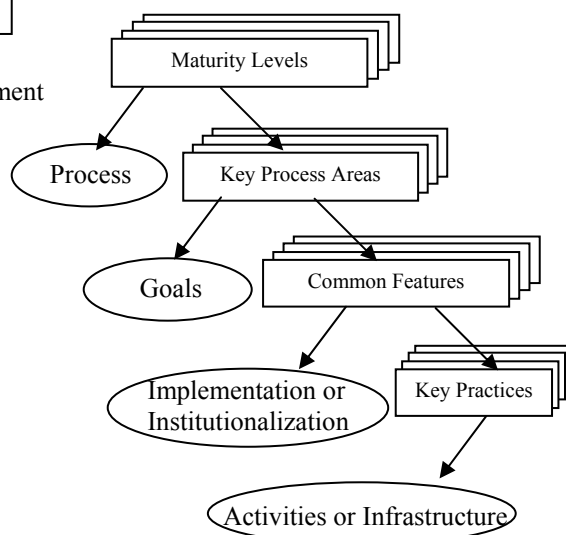


Figure 2. The Internal Structure of the Maturity Levels in CMM [5]

In the CMM Model, shown in Figure 1, principles and practices that lead to better outcomes are organized in five levels, giving a path to incremental adoption of best practices, more process visibility and control, and improved outcomes. Each level forms a foundation from which to achieve the next level, so trying to skip maturity levels could be counterproductive. An organization can adopt specific process improvements at any time, however, processes without proper foundation fail under stress. Following the CMM framework tends to produce stability in process improvement since the required foundations have been successfully institutionalized.

Except for Level 1, each maturity level has an internal structure shown in Figure 2. A maturity level indicates a capability to perform a process with predictable results and is associated with a set of key process areas on which an organization should focus as part of its improvement effort in order to achieve their goals. Each key process area is organized into five sections called common features:

- *Commitment to perform* – the policies, leadership practices and actions that ensure that the establishment and continued use of the process
- *Ability to perform* – the practices that address resources, training, orientation, tools, and organizational structure that ensure that the organization is capable of implementing the process.
- *Activities performed* – the practices that address plans, procedures, work performed, corrective action, and tracking.
- *Measurement and analysis* – the process measurement and analysis practices that ensure that procedures are in place to measure the process and analyze the measurements.
- *Verifying implementation* – the management reviews and audits practices that ensure that activities comply with the established process.

These common features specify the key practices described by activities or infrastructure, that when collectively addressed accomplish the goals of the key process area. An organization is satisfies a key process area when the process area is both implemented and institutionalized.

6.2 Proposed Engineering and Technology Education Capability Maturity Model

The proposed model, called Engineering and Technology Education Capability Maturity Model (Larrondo Petrie, 2004b) uses the same framework of the CMM when describing the capability maturity of an engineering or technology program using the same levels of process capability maturity described in Figure 1.

Level 1: Initial – At this lowest level few processes are defined. Processes are adhoc and mostly reactive. Productivity and quality vary. Success depends on individual effort. Current levels of quality and productivity of peer programs/institutions are not known. To advance to the next level, the institution needs to identify and analyze peer programs, define its mission, goals, and objectives, and impose more structure and control on the process to enable more meaningful measurement.

Level 2: Repeatable – The institution has developed policies for managing the educational programs and procedures to implement those policies. Disciplined processes are established to identify the inputs and outputs of the process, the constraints and the resources used to produce the final product. Basic project management practices are used to track cost, retention and productivity and compare them with peer institutions. There is some discipline among faculty in documenting course syllabi, goals, objectives, learning outcomes, results and feedback, so that successful course delivery can be repeated. A strong curriculum for each degree program includes engineering sciences, humanities, social sciences, communication skills and an appropriate professional component. The institutional requirement for achieving Level 2 is that there are policies that guide the degree programs in establishing the appropriate management processes, their program planning and tracking are stable and earlier successes can be repeated.

The program's process is effectively controlled by a program management system, following realistic plans based on the performance in previous terms. The key process areas at Level 2 are:

- Degree program and course management
- Quality assurance
- Management of adjunct faculty
- Program/course tracking and oversight
- Program planning
- Identification of peer institutions

Level 3: Defined – The educational process for both management and educational activities is documented, standardized, and integrated into a standard process for the institution. Mission, goals and objectives are published in the catalog and posted. All programs use an approved, tailored version of the institution's standard process for developing and maintaining degree programs and courses. Includes all characteristics for Level 2.

- Document faculty credentials
- Publish learning outcomes in course syllabi
- Document strategies to attain learning outcomes
- Publish mission statement for University and College of Engineering
- Publish programs educational objectives for program in the catalog
- Peer review of proposed programs/courses
- Integrated program management
- Training program
- Involve constituencies in reviewing/updating educational objectives
- Institutionalized processes

Level 4: Managed – Detailed measures of the educational program and courses are collected and used to quantitatively understand and control both the process and the programs. Includes Level 3 characteristics.

- Implement feedback and assessment processes to determine if intended outcomes are achieved
- Quality management
- Quantitative process management
- Comparison with peer institutions
- Sufficient staff allocation/ compensation
- Strong institutional support and good facilities
- Involve constituencies in outcomes evaluation

Level 5: Optimizing – Continuous process improvement is enabled by quantitative feedback from the process and from testing innovative ideas and technologies. Includes all characteristics of Level 4.

- Process change management
- Technology change management
- Total faculty involvement
- Defect prevention: Student retention management, graduation rate management
- Feedback results in changes in program

Once the program has attained Level 5 then the program is ready to undergo Accreditation and Substantial Equivalency evaluation.

7. Conclusions and Role of LACCEI in Program Recognition

This paper has described the critical need for engineering program recognition for Latin America and the Caribbean. Three multinational accords and a number of organizations were discussed that assist other countries in attaining this recognition. It was noted that no Latin American nor Caribbean agency has signed any of the accords. Some Latin American and Caribbean countries are participating in UNESCO's IESALC's RIACES organization but only one, Argentina, has any documentation on accreditation of engineering programs. Substantially Equivalency has existed for fifteen years but less than a handful of Latin American and Caribbean engineering

programs have attained this recognition. The cost of the procedure and non-familiarity with the accreditation process may be a deterrant for these institutions.

Latin American and Caribbean countries vary greatly in their recognition of the importance of accrediting engineering programs in their institutions and their experience with accreditation. A new model (Larrondo Petrie, 2004a), based on the Capability Maturity Model was presented at last year's Latin American and Caribbean Consortium of Engineering Education (LACCEI) conference and a new Accreditation and Program Recognition Committee was formed. Using this CMM-based model as a strategy to increase Hispanics in the U.S. engineering workforce and graduate programs was presented at the first Hispanics in Engineering National Conference held in Puerto Rico (Larrondo Petrie, 2004c). A presentation at the LACCEI Board of Directors meeting co-located with a national conference of industrial engineering faculty in Perú, yielded much interest and further plans of collaboration to expand the initiative. An extension of the model was presented at the American Society of Engineering Education (Larrondo Petrie, 2004b) and, by invitation, to the ASEE International Colloquium on Engineering Education in Beijing, China (Larrondo Petrie, 2004b), and further invited to be published as a book chapter for publication in China and at an international conference in Australia. Interest in this model shows that engineering program recognition is a global concern. Presenting at international conference, national conferences and regional conferences should bring more attention and funding to this initiative. This model should facilitate the efforts of engineering programs unfamiliar with the accreditation processes to organize their efforts, processes, and policies in a more effective manner to move closer to accreditation

At joint conference with CONFINI, details of successful homologation of courses and programs was described, which homologated a program to a Florida public university for the purpose of creating a dual degree program, where students attend the LAC institutions their first 3 years and the Florida institution their last 2 years, thus resulting in 2 diplomas and potential licenture as professional engineers in their home country and in the United States. Similar homologation has been achieved with institutions in the European Union. Since the state universities in Florida have standardized curriculum, homologating with one achieves homologation with all. This is one step in achieving program recognition. Some Florida public universities, such as Florida Atlantic University, also have a Joint Bachelor – Master program. With homologation and accords between universities, since most Latin American and Caribbean engineering degrees are 5 year degrees and those of the U.S. are 4 year degrees. This program facilitates the student receiving double engineering B.S. degrees from the two countries plus a Master's degree with a reduced number of credits.

CONFINI joined as the first Associate Member of LACCEI in 2005. If more organizations of engineering faculties in different engineering disciplines join LACCEI as Associate Members in this effort, an effective working group could be formed to better address this challenge. LACCEI could also join as Associate or Affiliate member of organizations, such as UNESCO's IESALC's RIACES to expand the dissemination of information and influence the formation on engineering accreditation agencies in the Latin American and Caribbean countries that can sign the Washington Accord. To reduce the cost of getting accreditation or international recognition, perhaps an umbrella Latin American and Caribbean organization of engineering accrediting agencies would be beneficial in assisting countries who do not have engineering accreditation agencies in achieving substantial equivalency.

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FEANI: Fédération Européenne d'Associations Nationales d'Ingénieurs. <http://www.feani.org>

IESALC: Instituto Internacional para la Educación Superior en América Latina y el Caribe (International Institute for Higher Education in Latin America and the Caribbean), United Nations Educational, Science, and Cultural Organization (UNESCO). <http://www.iesalc.unesco.org.ve>

IICA: Instituto Interamericano de Cooperación para la Agricultura,

INEER: International Network for Engineering Education. <http://www.ineer.org>

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<http://ingenierias.uanl.mx/archivo.html>

INQAAHE: International Network for Quality Assurance Agencies in Higher Education.
<http://www.inqaahe.org/>

IRoPE: International Register of Professional Engineers. Europe's Engineers Mobility Forum, Europe's Engineering Technologists' Mobility Forum, Europe. <http://www.engc.org.uk/international/irpe.asp>

ISTEC: Ibero American Science & Technology Education Consortium, <http://www.istec.org>

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Biographic Information

María M. LARRONDO PETRIE: Dr. Petrie is Associate Dean of Engineering and Professor of Computer Science & Engineering at Florida Atlantic University (<http://www.cse.fau.edu/~maria>), and a member of the FAU Secure Systems Research Group (<http://www.cse.fau.edu/~security>). She is Vice President of Research of the Latin American and Caribbean Consortium of Engineering Institutions, serves on the American Society of Engineering Education's Minority Division Board, was on the ACM SIGGRAPH Education Board and was President of Upsilon Pi Epsilon Honor Society for the Computing Sciences. She has published numerous papers in the areas of security, analysis & design of complex systems, software engineering, computer graphics and engineering education.

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