The Road to Engineering Programs Accreditation Under NAFTA

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Summary
This paper describes the current status of the Engineering Accreditation rules contemplated under NAFTA and the significant practical obstacles that exist in the implementation of such rules.

Introduction
The North American Free Trade Agreement (NAFTA), in effect since January 1, 1994, has spurred considerable growth in the export business of its signatory nations. However, in spite of its economic success, one of the issues covered by the rules of the agreement has received considerable attention in recent months: the exchange of professional services across the border with Mexico. This increased attention is rooted in a number of circumstances, among them the U.S. presidential election process.

On a purely rational level, the issue of legal immigration of Mexican engineers could almost be dismissed on the basis of its relative magnitude. Currently the U.S. issues about 2500 temporary entry visas to Mexican nationals in all professional fields combined. Even if we assume that 80% of these went to engineers, the total would amount to about 1/1000 of the Engineering/Technology employment in the U.S., and to about 1.6% of the number of graduates of these disciplines in the same year. It is also illustrative to consider that the influx of engineers into Mexico under NAFTA rules is also a source of anxiety, despite the fact that the Education Ministry reports a grand total of 50 foreign applications for accreditation of an engineering degree, with the objective of practicing the profession in Mexico (none of these applications were submitted by U.S. or Canadian nationals.)

Building a multi-national economic union is necessarily a complex and painful process, given the large differences that typically exist in natural resources and technological development; it happened with the EEC and it will happen with NAFTA.

Engineering accreditation under NAFTA
An important aspect of the exchange of services among the NAFTA partners will be the evaluation of professional credentials. The U.S. and Canada have developed independent but similar engineering accreditation systems, and have equivalency agreements in place since 1979. After a two-years long negotiation period, a preliminary agreement to extend the equivalency in engineering degrees to Mexico has been drafted. The working document is officially called the Agreement for Mutual Recognition of Professional Certificates and
Licenses (Acuerdo de Reconocimiento Mutuo de Licencias y Certificados Profesionales), prepared by the Mexcian Committee for the International Practice of Engineering, the United States Council for International Engineering Practice, and the Canadian Council of Professional Engineers.

According to the specific requirements outlined in the proposed agreement, for example, an application for a temporary license to practice engineering in another NAFTA country requires “12 years of experience for graduates of an accredited academic program and 16 years if not accredited. It is possible to obtain a permanent license, after three more years of practice with a temporary license.” NAFTA engineers are also required to pass two examinations, one in the language of the country of destination, and a second one on its applicable laws and regulations.

The three NAFTA Governments are expected to evaluate this agreement, and sign its final form some time in 1996\(^6\). Hopefully this evaluation will involve a review of the major differences in the participating systems of engineering education.

Engineering education: rules, resources and needs

The education of an engineer requires the confluence of a number of essential factors. This is implicitly recognized, for example, in the ABET Criteria\(^9\). A successful Engineering Program requires an appropriate number of highly-educated faculty, with a workload that allows them to perform their duties effectively. It also requires adequate physical resources: laboratories, computing services and libraries.

One of the most significant problems in establishing equivalency between engineering programs in

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<th>Mexico</th>
<th>U.S.</th>
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<tr>
<td>Student population in technical fields, per million of total population</td>
<td>3960.8</td>
<td>2100</td>
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<tr>
<td>B. S./E.I.E. degrees per million of total population</td>
<td>421.7</td>
<td>290.1</td>
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<td>Graduate technical degrees per million pop.</td>
<td>14.12</td>
<td>121.94</td>
</tr>
<tr>
<td>B. S./II.E. level yield (degrees granted/student population)</td>
<td>10.65 %</td>
<td>13.81 %</td>
</tr>
<tr>
<td>B.S. level students/full time faculty</td>
<td>45.01</td>
<td>24.78</td>
</tr>
<tr>
<td>Percentage of faculty with a doctoral degree</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>Percentage of faculty with a bachelor’s degree</td>
<td>45</td>
<td>0</td>
</tr>
<tr>
<td>Average age of faculty</td>
<td>&lt;30</td>
<td>&gt;40</td>
</tr>
<tr>
<td>Average teaching load (hr of class/week)</td>
<td>10-15</td>
<td>3 - 6</td>
</tr>
<tr>
<td>Average yearly salary (U.S. dlls/year)</td>
<td>7,000-16,000</td>
<td>55,260</td>
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Notes:  
1. The figure for Mexico includes all university disciplines, not only technical/engineering fields  
2. Some of the figures for Mexico are estimates, based on limited information

Table 1. Some comparisons between the systems of engineering education of the U.S. and Mexico\(^6\)
Mexico and the U.S. is the great disparity in resources. Table 1 shows a number of comparisons in key resource areas to illustrate this point.

Another dimension of comparison is the budget allocation per student of Institutions of higher education. Engineering education is a costly endeavor; creativity and hard work can ameliorate the impact of insufficient budget allocations for a short time, but in the long run, these insufficient allocations will necessarily affect the quality of the graduates. A comparison of student populations and total budgets, was made among the following representative institutions:

From the United States:
- a) Two highly-selective private institutions (“Ivy League” schools)
- b) A private institution of representative characteristics
- c) Three representative state-supported schools

From Mexico:
- a) One of the most selective and expensive (in relative terms) schools of engineering
- b) One of the largest state-supported universities.

This comparison is shown in Figure 1. Two important observations can be made from this comparison. The first is that the state-supported Mexican universities operate in an enrollment scale that has no counterpart in the U.S. In fact, the National University currently has an enrollment of over 240,000 students. The second observation is that even the small, most expensive (both relative terms) Mexican institution is severely underfunded, when compared to universities in the U.S.

Key issues in NAFTA-wide accreditation of engineering programs

At this point in time it is still unclear what direction the expected “NAFTA-wide” accreditation process might take. The unavoidable influence of political pressures might result in an agreement that will fall between two extreme positions: politically expedient and technical solutions.
The Politically Expedient Solution

In this scenario, each of the NAFTA accrediting bodies would freely decide what accreditation of engineering programs means for the corresponding Country. This would be a very unfortunate result in the case of Mexico, because accreditation is currently little more than a rubber-stamping process administered by the government, through the Ministry of Public Education; independent evaluation of programs is not viable because almost 90% of the Schools of engineering and technology are also run by the government. NAFTA is supposed to bring about the modernization of all aspects of Mexican life. Industries need internationally competitive engineers, to be able to successfully compete internationally, A political solution to the accreditation question would be unfortunate, because it would keep the engineering education system insulated from international competition, and at the same time obligated to educate engineers able to compete in the very same arena.

The Technical Solution

Under this scenario, Mexico would implement an national accreditation system closely modeled after ABET. This system would then set-up clear standards of accreditation, compatible with those in the U.S. and Canada, and the accrediting agency would apply an open evaluation process to determine the status of the various programs. Purely in terms of long-term effect over the quality of the programs, this would be the best alternative. However, it would also create a disruption of the current system of such magnitude that it might be almost impossible to implement. Consider the two issues of funding and academic credentials of the Faculty:

a) Funding. The Mexican State-supported institution represented in Figure 1 could be made competitive by either increasing its budget by a factor of almost 4, or reducing its size by the same factor. Under the limitations imposed by the current Mexican economic crisis, budget increases of this magnitude are not possible; under the limitations of the current political crisis, a reduction in student enrollment is very unlikely.

b) Academic credentials of engineering faculties. Strict application of ABET rules to the Mexican engineering faculties would force institutions to lay-off over 70% of the current faculty; it would also require the services of a large number of Ph.D.-level professors far exceeding the current availability. Finally, it would have significant economic implications. In fact, the current system of engineering graduate programs could accommodate a student population many times larger. From the figures quoted in Table 1, it should be apparent that there is almost no economic incentive for pursuing an academic career in Mexico.

The Mexican System of Higher Education has managed to survive under the harsh conditions imposed by the endemic political and economic crises. However, it must be stated that the quality of education provided by the Mexican Universities has not deteriorated to unacceptable levels. This is due in large measure to the hard work, professionalism and dedication of Mexican academics.

Conclusion

The Engineering Education Systems of the United States, Canada and Mexico are working towards a NAFTA-wide agreement on program accreditation. Clearly the final shape of this agreement, and, more importantly, its rules of implementation, will fall somewhere between the two extreme solutions described in this paper. In the author’s experience as Vice President of the Mexican Association of Engineering Schools, Mexican engineering educators are very much aware of the significant obstacles described above. The process of integration of the Engineering education systems in North America will be facilitated if an equivalent awareness of these issues can be promoted among their counterparts in the U.S. and Canada.
References


4. “More Engineers Abroad (But Fewer at Home)”; ASEE PRISM, Volume 5, Number 6; February 1996.

5. “Sin trabajo o subempleados, 50% de ingenieros y 25% de médicos”; Georgina Saldierna; Mexican Newspaper La Jornada; 30 de diciembre de 1995.


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