

Quality Assurance of Engineering Undergraduate Programs in Colombia, a Social Duty and a Competitive Strategy

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Abstract

In Colombia, the educational development of engineers must meet two particular challenges in the immediate future. The first one has to do with the unrestrained growth and diversification of undergraduate programs in engineering, which although helps to meet demand, generates problems with respect to quality. The other challenge to be taken into account has to do with globalization, since not only is the higher education market ever more competitive, but it is also true that engineers increasingly work in their profession in countries different from those where they received their higher education. This creates the need for international accreditation of programs and homologation of professional degrees.

It is within this perspective that quality assurance has been conceived in Colombia in the last few years. It includes both accreditation of universities and their programs, as well as the establishment of minimum compulsory standards for programs and program evaluation exams that students must take before obtaining their degrees.

By virtue of the similarities of the region's conditions, this analysis is relevant for all countries in Latin America.

Introduction

As in other Latin American countries, during the last decade in Colombia there has been unrestrained growth of engineering undergraduate programs, not only in the number of programs, but also in engineering disciplines. Despite contributing to greater coverage of higher education in the country, this phenomenon has caused serious deterioration in the quality of service institutions render. This is the first challenge the country must face in the immediate future within the context of educating engineers.

This situation originated based on the 1991 Colombian Constitution, which enshrined university autonomy, and through Law 30 of 1992, which confers universities the right to create, organize, and develop new programs. As a result, in exercising this new right, the number of undergraduate engineering programs in higher education institutions grew by more than 300% between 1992 and 2000. During that period, the total number of programs went from 201 to 622. In addition, there was a substantial increment in the variety of engineering disciplines. There were 37 engineering

disciplines in 1992; by 2000, there were 104². If one compares statistical data on engineering disciplines with other Latin American countries such as Brazil, Argentina, Chile, Mexico, Bolivia and Peru, it can be seen that Colombia, which has a slightly larger population than Argentina, has double the number of engineering disciplines. Colombia has two and half times the number of engineering disciplines Brazil has, even though this country has four times the population of Colombia. Mexico has a similar proliferation of engineering disciplines but with a population that is 2.4 times larger. In general, Colombia has a greater number of engineering disciplines than most Latin American countries¹.

This result could be interpreted as the State and society's effort to widen the educational base of professionals, specifically engineers, the country is so urgently asking for. However, the statistics mentioned are surprising, not only because they seriously question higher education institutions for an equivocal interpretation of university autonomy, but also the government's will to guarantee quality assurance and high academic standards such programs are supposed to operate under and offer¹. Although since the mid 90's, there is a growth tendency in the higher education coverage index in Colombia, the increase has been less than a point yearly, and it has not reached the dynamism of other countries in the area. Year 2000 comparative data show that while Colombia reached 15% coverage, as did Brazil and Mexico, Peru reached 26%, Venezuela 29%, Uruguay and Costa Rica 30%, Chile 32% and Argentina reached 36% coverage. It is worth mentioning that Colombia's population is nearly 40 million people and that 934,085 students registered in the higher education system during the year 2000¹⁰; approximately 200,000 of them in the engineering fields.

The second challenge has to do with globalization directly. This factor dominates society culturally. Competitiveness conditions will impose a clear international vision on higher education. For a long time in Colombia, universities were protected against the international competitiveness that is so common in industry. This scenario has changed, and at present, we have a great number of foreign universities offering their programs. The tendency is towards an authentically competitive market on higher education on a global scale. Free trade treaties such as ALCA will undoubtedly propel this tendency further. The globalization phenomenon has resulted in the need to ensure that students will be able to perform professionally not only in their own countries but also in other regions of the world, and to take on challenges within the framework of an open economy. This in turn, demands that our local undergraduate engineering programs and therefore the related degrees be internationally recognized.

In order to confront these challenges, and particularly the first one, during the last few years the National Government and the academic community have joined in their efforts to orient higher education towards excellence and the construction of a true quality culture. Strategic decisions and measures taken are based on the premise that quality must be an imperative as it is the very essence of public service, and that a poor quality education is a deception that leads to frustration. With respect to engineering programs, the National Accreditation Council (Spanish acronym CNA), which counsels the National Government, is in charge of quality assurance processes, which is essentially the responsibility of engineering schools.

Several instruments have been designed to improve educational quality and are being applied to undergraduate engineering programs. They include: High quality (excellence) voluntary accreditation, minimum obligatory quality standards to authorize opening of new programs and continuity of existing ones, and program quality evaluation examinations students must take

before obtaining their degrees. This quality educational policy is complemented with Institutional Accreditation. It is also a voluntary high quality evaluation, which was recently instituted in the country. Among its objectives is to serve as a means for universities to be accountable before society for the educational service they provide and to inform about the individual quality of each institution.

Improving educational quality was one of the main achievements of the last government. The new Uribe administration has made the political decision to continue in the same direction by strengthening and widening the different strategies.

Undergraduate Program Accreditation

Accreditation of higher education in Colombia is a relatively recent process. In fact, it originated with law 30 of 1992, which develops rights and duties enshrined in the 1991 Constitution. Its main goal is promoting quality in higher education services. Within this context, the National Accreditation System (Spanish acronym SNA) was created in order to guarantee that institutions that voluntarily join fulfill the highest quality requirements. Accreditation is based on the following policies⁴:

- It is voluntary
- It is temporary
- It is not punitive in nature. No institution may be sanctioned for not belonging to the system of for lack of accreditation for its programs
- The nature of evaluation processes is eminently academic
- It seeks internationally recognized high levels of quality
- It was initiated with undergraduate programs
- The decision not to accredit a program and the details of the process are confidential
- The accreditation process does not produce ranking of institutions or programs
- It does not seek homogenization of institutions

The National Accreditation Council (CNA), which is formed by seven academics, is responsible for coordinating the accreditation process for all undergraduate programs offered in the country. The council initiated activities during the second semester of 1995.

The Accreditation model adopted evaluates the program's quality through factors that group elements or characteristics it should have. These characteristics are dimensions of quality and are evaluated through variables, which are their attributes or manifestations, and more specifically through indicators both quantitative and qualitative. The factors this model takes into account are:

1. Institutional Mission and Objectives

It includes quality characteristics that refer to institutional mission, purpose, goals and objectives, to the educational project, to the formation of an academic community, to the institution's internal and external interactions and to institutional strategies to maintain an appropriate environment. There are 10 characteristics, 25 variables and 30 indicators.

2. Students and Professors

This factor includes characteristics related to admissions, and the education and make up of the student body and with selection, make up, classification, performance and improvement of the teaching community. There are 17 characteristics, 42 variables, and 82 indicators.

3. Academic Processes

It includes characteristics more intimately related to teaching programs, specially emphasizing integral education, and with research and social projection projects. There are 16 characteristics, 63 variables, and 88 indicators.

4. Institutional Welfare

It includes those characteristics closely related to institutional policies and strategies that ensure the favorable climate required for development of substantive functions, and the availability of appropriate facilities and services to foster welfare. There are 5 characteristics, 12 variables, and 18 indicators.

5. Organization, Administration and Management

This factor includes those characteristics related to the structures and mechanisms the institution has established and that enable fulfillment of institutional and program specific purposes, goals and objectives. There are 6 characteristics, 18 variables and 20 indicators.

6. Alumni and their impact on society

It includes characteristics related to the involvement of the institution or program with the environment. There are 5 characteristics, 23 variables, and 24 indicators.

7. Physical and Financial resources

It includes characteristics related to the facilities and the operational and investment budgets that reflect academic needs and serve them. There are 7 characteristics, 15 variables, and 29 indicators.

The current model includes 7 Factors, and 66 Characteristics that are evaluated through 198 Variables and 291 Indicators¹³.

Taking into account that the processes' goal is to promote quality, and not just acknowledge it publicly, the dynamic dimension of the evaluation refers both to the current level of quality reached so far, and to the plans for improvement that result from the self-evaluation process. This dynamic dimension provides the CNA with evaluation elements to recommend the Ministry of Education on the term for which the accreditation should be issued. The minimum term is three years and the maximum is ten years. When accreditation is not recommended, the CNA advises the Ministry of Education on recommendations to be made to the institution to improve the program that was submitted for accreditation.

The accreditation process takes place according to the following procedure, which requires compliance with certain Initial Conditions the institution must fulfill before proceeding to subsequent stages:

1. The Self-Evaluation each institution that wishes to accredit one or more of its programs must make.
2. The External Evaluation done by academic peers designated by the CNA
3. The Final Evaluation done by the CNA based on the self-evaluation, the external evaluation and the institution's response to the external evaluation report.

4. The Accreditation Act issued by the Minister of National Education based on a favorable final accreditation recommendation by the CNA. If the final recommendation is not favorable, the Minister of Education makes recommendations to the institution on how to improve in order to be able to apply for accreditation again after a minimum of two years, if it so desires.

Despite the short time since its initiation, the results of the accreditation process in Colombia have been positive and foretell success in the short and mid term. It is true that only a relatively small number of programs started the accreditation process and has finished it successfully. However, the number of programs currently in the process of accreditation has significantly increased in the last two years. Colombia's experience in this respect has become the reference for other countries in the region. One can conclude that voluntary accreditation has opened the road for a culture of quality in the Colombian academic community. This implies an increase on market competitiveness, which in turn constitutes a public guarantee that good quality has taken root in the higher education sector's conscience as a need to account before society for the services it renders.

As of December 31, 2002, the number of accredited programs was 128 from 26 universities, approximately 35 of which were engineering programs. This number represents 3.9% of the total number of undergraduate programs enabled to be accredited⁸. In 2002, there were 355 other programs in process, with approximately 120 of them in engineering. According to 2000 statistics, the number of undergraduate programs offered in the country was 2,303 (not including technical and technological education programs).

Towards the end of 2001, the CNA considered it necessary to review and update the model¹³ in order to answer critics that pointed out that the current model is too detailed, wasteful and repetitive. In addition, it is intended that the new model include only aspects relative to the programs. Therefore, it is probable the same policy that was adopted for the institutional accreditation will be adopted here. That is, to grant the academic community the possibility to build its own variables and indicators. This will guarantee that procedural coherence will be maintained in both cases. The academic community is still evaluating the new proposal. It simplifies the process by reducing the number of characteristics from 66 to 43.

The new proposal contains the following analysis factors⁹:

1. Institutional Mission and Objectives

It includes 4 characteristics related to the Institutional Mission, the Institutional Project, and the Program's Educational Project and its Pertinence.

2. Students

This factor includes 7 characteristics related to the admissions processes, the number of students admitted, permanence and desertion of students in the program, participation in integral education activities, competences, student regulations, and student evaluation.

3. Professors

It includes 8 characteristics related to selection of program professors, Professor Regulations, number, dedication and educational level of professors, professor development policies and programs, interaction of professors with academic communities, teaching, research and extension incentives, production of teaching materials, and salary based on merit.

4. Academic Processes

It includes 13 characteristics related to curricular integrality and flexibility, interdisciplinarity, the program's national and international relationships, teaching methods, pertinence of students' work, the program's self-evaluation and regulation, educational research, commitment to research and social projection activities, and bibliographical teaching support, and computer and communication resources available to the program.

5. Institutional Welfare

This factor includes 1 characteristic related to university welfare policies, programs and services.

6. Organization, Administration and Management

It includes 4 characteristics related to program organization, administration and management, and to program communication and information, direction and promotion.

7. Alumni and their impact on society

It includes 3 characteristics related to the program's influence on the environment, follow-up of alumni, and impact of alumni on their social and academic environment.

8. Physical and Financial resources

It includes 3 characteristics related to installations and financial resources available to the program and with resource administration.

Minimum Quality Standards

Minimum quality standards³ are part of a higher education quality inspection, review and control, and in this sense are qualitatively different from voluntary accreditation, which as was previously pointed out, has as its fundamental goal to guarantee society that institutions that are part of the system fulfill the highest quality requirements. Definition and verification of standards is a way for the State to ensure that programs fulfill basic conditions (minimum quality standards) that guarantee education quality and that are allowed to render services only if they fulfill such standards. Therefore, compliance with minimum quality standards for creation and implementation of programs is obligatory. Programs that comply with the standards are issued a Qualified Registration valid for 7 years. The registration must be renewed upon its expiration.

There are sixteen (16) quality standards for the creation and implementation of undergraduate engineering programs. The university must provide information for each one: Justification of the program; engineering discipline denomination of the program; basic curricular aspects; academic credits; research education; social projection; student selection systems; evaluation systems; professors; education media available; physical infrastructure; academic and administrative structure; Self-evaluation; alumni; university welfare; and program publicity.

Quality standards for engineering⁶ were regulated in May 2001. Therefore, all working undergraduate engineering programs, except those that have voluntary accreditation within the framework of the National Accreditation System, have two years from the date of the regulation, i.e. until May 2003, to submit information of compliance with standards for evaluation and to obtain the qualified registration. Failure to obtain the qualified registration within this time means the institution will no longer be able to offer that program.

Given the complexity and magnitude of higher education in Colombia, quality standards

formulation has been organized in several stages. The first one considered four areas of knowledge: engineering, health sciences, administrative and accounting sciences, and social and human sciences. Later stages will study other areas of knowledge and other educational modalities.

Finally, through quality standards, a refining process for engineering disciplines denominations in undergraduate programs has been initiated, so that degrees conferred by Colombian universities may be equivalent to those granted by foreign universities. The National Government, through the Ministry of Education, and with the support of the Colombian Association of Engineering Schools, Spanish acronym ACOFI, made a study in 2000 called “Nomenclature in Undergraduate Engineering Degrees in Colombia”². The study intended to bring some rationality to engineering disciplines denominations, to rescue engineers’ professional identity, and to establish nomenclature criteria closer to international tendencies in order to facilitate professional mobility and recognition of degrees. The results of this study were taken into account to define one of the quality standards that all undergraduate programs must obligatorily comply with starting in May of 2001.

Quality Examinations

In order to effectively develop the concept of higher education quality, as expressed in Law 30 of 1992, and to advance towards an integral model of quality assurance that provides a balance between the concepts of autonomy, quality and inspection and monitoring, in 2001 higher education quality examinations were obligatorily instituted for all undergraduate students before they graduate. This instrument intends to verify not only the quality of programs, but also to deliver objective and opportune information that will improve decision making in higher education. In the first stage, the students that will be subject to this process are those in medicine, engineering and law programs. In the engineering particular case, the first exams took place during the first semester of 2002. It was given to all Mechanical Engineering students in the country. For 2003 preparation, design and administration of exams for students in Agricultural, Civil, Electrical, Electronic, Chemical, Industrial, Computer, Mechanical, Materials (including Metallurgy), Telecommunications, Environmental, Geological, Mines, and Food Engineering programs are expected. These engineering disciplines programs include more than 80% of all students registered in undergraduate engineering programs in the whole country.

Institutional Accreditation

Since the beginning of its activity, the CNA considered Institutional Accreditation⁵ important. However, priority was given to undergraduate program accreditation given the number of this type of programs created since 1992, often without rigorous quality control. At the beginning of 1999, work was initiated to establish institutional accreditation, and by June of 2001, the academic community was presented with the system’s final version. Institutional and program accreditation have several similarities: both refer to high levels of quality, both are voluntary, both are based on self-evaluations, evaluations by peers, and the final evaluation. However, there are also some differences between the two. The topics evaluated, emphasis, purpose and procedures are different. To summarize, the model proposed for Institutional Accreditation includes 10

Factors, and 33 Characteristics¹³. Perhaps the greatest innovation with respect to program accreditation is the freedom conferred to institutions to construct Variables and Indicators necessary to evaluate fulfillment of the characteristics. This accreditation is given for a minimum of five years, and a maximum of ten years.

Conclusions

Challenges are still great. We are going through a transformation process that requires consolidation of different instruments to improve quality and evaluation of strict compliance with goals adopted.

Undoubtedly, higher education is for Colombia, and for the rest of the area's countries, a strategic element in the construction of more autonomous, just and democratic societies. It is also an essential instrument to compete in a globalized economy where knowledge is an indicator of human development in a nation. Colombian efforts in the field of higher education are still insufficient although data on coverage according to last year's statistics show growth. With respect to quality improvement, the government of President Pastrana (1998 – 2002) represented an important step forward. What is certain is that Colombia's coverage is still below international levels; from the perspective of a true institutional culture, good quality can only be found in a small group of universities and programs known for their prestige, but not, as it would be desirable, in all the other higher education institutions and programs that constitute the academic offer in the country. With respect to higher education, the current Administration has set a goal of creating 400.000 new educational seats. This is a laudable and valid goal provided it includes a quality policy⁸.

The quality of higher education becomes more important in Latin American countries every day. Last November, in Madrid Spain, the Ibero-American Ministers of Education signed a political statement to promote quality and higher education program and institution accreditation, thus supporting the creation of an Ibero-American Network of Higher Education Quality Agencies (Red Iberoamericana de Agencias de Calidad de la Educación Superior) (RIACES). Collaboration among agencies in charge of evaluation and accreditation will be fundamental for action based on common criteria and procedures and that, therefore, advance effective consolidation of higher education quality in Latin America and the Iberian Peninsula. In addition to raising quality assurance national standards, regional cohesiveness regarding evaluation and accreditation facilitates the movement of students and professionals, homologation of degrees, and the promotion of regulations that guarantee quality of products and services. During the same month, but at in a different geographical location, Ministers of Education of the eight countries participating in the Plan Puebla – Panamá (PPP) signed an understanding memorandum at the Inter-American Development Bank headquarters in Washington to create a Project Accreditation and Promotion Commission to encourage and promote education in the Meso-American region. One of the areas of cooperation the countries identified is related to a common higher education accreditation system.

These initiatives and other similar ones in different disciplines and professions, such as a proposal to create an "Engineering Education Ibero-American Area" promoted by the Ibero-American

Association of Engineering Education Institutions”, ASIBEI (Spanish acronym), share not only those objectives, but also aim to obtain recognition for our programs and degrees in the European Union countries, as well as the United States and Canada. Otherwise, the “new economy” that definitely promotes liberalization of the international markets, and which has started to have effects on higher education as a commercial field, could place us in a very unfavorable position when competing for the best students.

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¹ ACOFI: Asociación Colombiana de Facultades de Ingeniería [Colombian Association of Engineering Schools]

² ICFES: Instituto Colombiano para el Fomento de la Educación Superior [Colombian Institute for the Promotion of Higher Education]

³ CNA: Consejo Nacional de Acreditación [National Accreditation Council]