

Documentary Analysis of Professionalization and Certification Processes Case Study: Certification of Professional Engineering in Colombia

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Abstract

The engineering profession has become the importance of social risk as it is considered an activity in high-impact exercise has on society. Determine the assessment criteria for the certification of engineering professionals is essential to analyze the level of competition that have engineering professionals in Colombia and to compare the levels of competence of engineering professionals worldwide The objective of this project is to conduct an analysis of the various models of validation of skills, abilities and experience of professional engineering advice and applied by international certification agencies to determine the appropriate model for the certification of professional engineering in Colombia by Multi-Criteria Decision Analysis method with the application of AHP (Analytic Hierarchy Process).

Keywords

Professional Certification, Professional Practice, Professional Experience, Multicriteria Decision Analysis, Analytic Hierarchy Process

1. Introduction and Literature Review

The FTAs signed and under negotiation with other countries of Colombia , aim to reduce and eliminate barriers to the free movement of professionals in order to develop businesses that generate profits for each of the parties, this requires the professional security meets the minimum requirements aligned with international standards . The recognition of certifications, licenses among countries with regard to education and professional experience, rules of conduct and professional ethics is essential to ensure free mobility.

The engineering profession has become the importance of social risk as it is considered an activity in high-impact exercise has on society, regulation stems from laws passed by the Congress and different branches emanating legislative decrees and regulations that establish their good practice.

Analyze the theme of professions from sociology, framing their importance in three key contexts: the individual as an active professional , the Professional Engineering Accrediting Associations as entities that regulate and control the professional work and professional society where plays and performs its work in engineering.

In Colombia the enforcement of regulations to ensure that it provides professional engineering professional tuition. The Professional registration is an administrative act where a Board Professional verifies the graduate professional meets certain regulatory requirements on documentary and procedural compliance to practice anywhere in the country.

On the international professional certifications are issued by independent certification bodies that perform the validation of professional qualifications , skills and experience , in order to ensure professional fitness based on established criteria .

The professional engineering certification performed by an independent certification body provides support for a specific career area that meets established criteria for the individual to exercise their profession in a particular country. Determining these endpoints for the certification of engineering professionals is essential to analyze the level of competition that have engineering professionals in Colombia and to compare the levels of competence of engineering professionals worldwide

This paper aims to develop the literature review to establish the methodology for to analyze various models of validation of skills, abilities and experience of professional engineering advice and applied by international certification agencies to determine the appropriate model for the certification of engineering professionals in

Colombia, by Multi-Criteria Decision Analysis method with the application of AHP (Analytic Hierarchy Process)

Ensure that professional engineering meets Colombian and foreign legal and regulatory requirements to practice engineering activities in the territory, requires the analysis of two fundamental issues: The professional engineering competence and the criteria for evaluation and validation of titles and certifications. At present the various free trade agreements encourage professional mobility in different countries with the international treaty. The different institutional processes develop Engineering Professional Councils establish a barrier necessary to ensure, validate and certify engineering professionals comply with regulations.

The current situation is framed professional engineering in that job mobility to other countries affected by compliance with the requirements for degrees abroad who request certification bodies and the criteria for each certification body are different in each of the countries.

The desired situation is framed in that adaptation to the conditions set by each country for professional mobility is necessary to identify and define the criteria for the certification of professionals based engineering analysis models of other countries and certification propose a model of multi-criteria analysis to support the certification process engineering professionals in Colombia.

Globalization and the development of free trade agreements have generated fundamental changes in the professional development of engineers globally. Changes in this professional environment studies have required level of the individual professional context, the institutional context of professional engineering associations supporting the engineer and sociological context in which it operates and interacts with the professional society. Different authors have made extensive studies of the behavior of professions in these three contexts , paramount to understand the importance of certification and the impact on society where the professional conducts its activities.

Professional Context

Chreim , Williams , Hinings (2007) determined that the investigations of the roles and identities of professions professional identity based not so deep as it does not account for the participation of institutional forces that affect this identity. The authors conducted an analysis of these forces on three levels: institutional, organizational and individual levels. The research findings from the agency realize that professional is enabled and constrained by institutional influences which frame the rules and regulations that make the material resource, in an environment that provides interpretation and legitimacy.

Professional identity is framed in personal values , professional ethics and the legal and regulatory determines the profession and professional associations promote and monitoring. Within the methodology carried out by the authors analyze the behavior of medical professional at a clinic in Canada which held the regulatory compliance of regional health authorities. Similarly, seeing the growth of clinical care established new units offering new services focused on health care, which identified substantial changes in the regulatory compliance requirements and expanded by the regulator. This affected the accounting system of the clinic going from fee for service to the establishment of a salary structure for doctors, managing a robust information system, recruitment of new doctors in different specialties offering and hire a nurse to offer services and perform the momentum of new medical specialties to offer.

The environmental forces that affect a particular professional market, determines major changes in the structure of the agency in the organizational and behavioral changes of the professionals in the specialization of their activities. The dynamics of these changes and the attention given in these processes of change determine the importance of staying on the market. The analysis performed by the authors through the case study of medical professionals in order to establish a model that explains the interactions multilevel institutional changes professional level were affected by the organization. While professionals developed micro processes that modified the professional role, the agency or organization developing macro processes that legitimated the professional role.

Evetts J. (2012) performed the analysis on professionalism in times of change and turmoil. Defines that the profession is distinctive and generic category of work and occupation and their importance from the sociological context of professions.

Institutional Context

Greenwood, Suddaby and Hinings (2002) examined the role of professional associations within the contribution to the change in the institutional field. They suggest that these organizations provide legitimization for change, as the theorization of the problems in order to provide specific solutions relying on exogenous innovations to adopt disseminate and implement the organization. The authors analyze this issue, review a case study with the Association of Professionals in Business in the province of Alberta Canada in a period of twenty years, from 1977 to 1997, notes the changing role specialization area accountancy to expand the business units and establish a broader spectrum of professional services framed in business management, financial management, within field service integrator. The study is part of the organizational transformation of a specific professional area a professional field, as well as structural and hierarchical changes that might occur in the integration of organizations. To understand the phenomenon was necessary to propose a theoretical context on organizational field, for this, the authors referenced the definition given by DiMaggio and Powell, understood as the grouping of similar areas of functional knowledge and develop their processes around these areas and deliver products and services useful for organizational field, generating a body that interacts internally and keeps its environment interactions collaborative relationship areas. Subsequently, the authors establish the steps for institutional change from abrupt movement given by the social environment, policy, regulatory, technological, deinstitutionalization is generated in which structural changes occur which establish new players in the business settings, functions and positions, institutional entrepreneurship, then follows a pre institutionalization which makes the structure refinement, technical feasibility checks critical, phase of theorizing which underlie the problem and its solution, together with diffusion and dissemination of information that legitimizes organizational change. Finally there is the re-institutionalization stage where consolidation processes legitimizing it becomes cognitive issue for the actors of the organization. Professional organizations will print security, confidence and support in the conceptualization of change as it generates monitoring and regulations that are consistent with the organizational practices of the areas that make up the organizational field.

To generate a legitimate organizational change, it is necessary to seek the support of organizations which provide security in the legitimization of new ideas. To study the case of R. Greenwood the shaft used to support the legitimization of change were the organizations or professional groups. Set a valid theories that satisfy the need for a group of professional fields and professional association that protects is essential to generate the expected organizational change. On the other hand, the analysis of the internal processes of the organization are essential for optimal results permeate change. The internal legitimacy is priority for change generated resulting overall legitimacy of the organization. The impact caused by environmental conditions, significantly established the need for change within the organization, which, as a result of the cause of the change, the organization responds in effect balance adjustments and changes to the system again. The processes carried out by the organization to create balance, is accompanied by inertia forces acting before making the change, so it is important to mitigate this effect contingent activities to mitigate and reduce resistance to change.

Smets M., Morris T., Greenwood R. (2012) developed a model of institutional practice driven by the change originated in the daily work of the people, from the results in a change in logic level field. They demonstrate how improvisation at work can generate institutional change and realize the existing contrast focused on entrepreneurship. They raise the specific mechanisms by which the change arises from daily work, becomes justified and spread within an organization enabling dynamic triggering change. The authors indicate that at present, the organizational changes occurring in the field, since the presence of the situations that generate external level change and the influence that these external forces lead, which generate a shock response against these influences. The solution applied through improvisation and collaboration of teamwork originate organizational change at the institutional level.

The study is part of law firms in a merger, require institutional guidelines framed for the purpose of legal regulations in each country. For the study, Anglo German law to offer cross-border services. Then apply multilevel model based institutional change in practice, which determines that institutional changes are dynamic and change when you are applying, so there are three main mechanisms of change: improvisation located, redirecting network regulation incorporating discreet.

Develop the implementation of organizational change from empirical development and practice of change, determines the urgency that mobilizes the rapid implementation of change. The experiences learned from the professionals in developing a common activity, but different normatively in the study countries, generates learning that can unify the criteria to develop new processes. The analysis and comparison of results in the development of these activities results in better learning practices and lessons to improve processes. Institutional change will always generate significant impacts on the adoption, implementation and monitoring of generators processes resulting change, resistance to own reluctance to change, however, to make changes through

multilevel or small changes to processes and group those changes to compile , generate less impact and less resistance to change at the institutional level . The different ways to address these changes and their disclosure will also generate the benefit of a minor impact.

Within the scope of professional certification is necessary to analyze three elements that are correlated : certification , accreditation and professional licensure . Jang , S. Yu , F. (2008) model make the comparison conducted by the United States on accreditation , certification and licensing of professional engineering and makes the comparison with the processes in Canada and the UK and their differences. He compares them with the system implemented in China. The implementation of the three elements of accreditation, certification and licensing is confusing, therefore the analysis performed by the authors of each of the elements and concepts determine the application and importance. Accreditation is applied to the universities and related people certification and licensing professionals to professionals working risky for society in terms of economic and human losses . Similarly, Kasuba , R , Vohra P, Vohra , D (2006) indicate that given the new circumstances of global competition , the globalization of markets through the article authors encourage globalize engineering curriculum . This innovative concept was applied in the industrial engineering program Northern Illinois University. DeKlab USA where he introduced the Global Engineering Emphasis. Global Engineering Emphasis includes a number of modules dealing with expectations of language, communication skills, multiculturalism sensitive aspects world class engineering where engineering integrates with society and business. This approach depends mainly on the support of companies and multinational corporations that provide the possibility of business practices (summer) and boarding business in specific cases and applied projects. Moreover, Patil (2004) presents a short application process for a scientific model of accreditation on the basis of research project certification to three phases. His references used are Mitkowski and Pudlowski on higher education curriculum. The author takes the three elements of accreditation, certification and licensing as a cycle. Includes an investigation of the important aspects of accreditation and evaluation processes in technology and engineering courses worldwide.

On the other hand, Kasuba , R & Vohra , P. (2004) review that there are differences in professional accreditation and professional licensure , the same way that not all engineering professions require professional license . Make a description of the professional licensing in different countries. It concludes that the process is unnecessarily complex, slow, that goes with the territory protection. Recommends implement agreements Washington Accord and Bologna Process / European Higher Education Area to get through this complex process.

Patil, Pudlowski and Zenon (2005) strive to identify the important issues of accreditation and quality assurance in engineering education worldwide. These issues should be taken into account when designing and developing a framework for the accreditation standards or model. Include a design strategy of multiple studies of cases in order to investigate important aspects of accreditation and evaluation.

An important case exposed by Pokholkov, et al. (2004) describes how from Tomsk Polytechnic University is established at a school of engineering with Russian - Asian agreements worldwide. Significantly from tradition and legitimacy of Tomsk Polytechnic University, comply with international synergies to create institutions for internationalization of engineering education. Kelly William E (2004) [11] aims to do a review of certification and processes related to civil engineering professionals. Stresses that while certification and accreditation are closely related, have important differences. His references to the regulations focus on the ISO, IEEE, and legal regulations.

Siskos et al. (2007), the case of professionals in information technology, which is being qualified home day through extension courses and acquire more experience to counter the demands of a new changing market. In this regard require the need to quantify and establish criteria to determine the importance of extension courses for professional qualification and experience. They propose a multi-criteria methodology to take into account the different criteria outside the profession institutional criteria to quantify and establish professional competence in information technology.

II. Methodology

Details and description of the research methodology.

Study Type - Descriptive Stud :

The study will be conducted to design the model for the certification of professional engineering. The documentary review and analysis of existing models of professional certification, the document review process of accreditation, certification and licensing of professional engineering.

Primary Sources:

Semi-structured interviews with experts of the three main estates. On behalf of the Company, establish contact with professional engineering advice and industry associations and unions. By the State, contact with experts in the field of engineering skills of engineering faculties associations and Ministry of Education. On behalf of the University in direct contact with a researcher who has conducted studies and applications in the development of projects in the relationship University - Business - State and multicriteria decision analysis. Forming an expert panel with the three entities of the University Relations - Company and State to build consensus decision matrix.

Secondary Sources:

Consultation and analysis of the literature on professionalism and professionalization (Sociology of the Professions) , professional certification models applied and the process of accreditation , certification and licensing of professional engineering . Desk study: scientific articles, papers on measurement multicriteria analysis. Revision documentary about the norms and regulations concerning professional certification certification bodies, professional engineering advice and governments of the countries studied. Collection of secondary information on partnerships and affiliated professional engineering advice in Colombia. Check secondary information from regulators such as the Ministry of Commerce, Industry and Tourism in relation to free trade and free mobility issue. Collection of information on the results of the expert panel. With the development of the proposed activities in primary and secondary sources, it is intended to comply with the overall objective to propose a model of multi-criteria analysis to support the certification process engineering professionals in Colombia.

III Results

To adapt to the conditions of mobility established by each country is necessary to identify and define the criteria for the certification of professional engineering based on the analysis of existing certification models and propose a model to support the multi-criteria analysis certification process engineering professionals in Colombia.

In the project the following results are expected:

- The construction of multi-criteria analysis model for the certification of professional engineering.
- The identification and definition of the criteria for the certification of professional engineering
- The Application of multicriteria analysis model by Professional Engineering Council in collaboration with renowned universities.

IV. Discussion

Project Impact Sectors:

The project will have a major impact on public and private universities to develop research projects and State Enterprises. The productive sector it is essential to know their contribution to the application of skills in the industry. Associations and Professional Councils because they depend heavily on the certification of professional engineering.

V. Conclusion

Vásquez (2011) [13] In analyzing the state of knowledge, rules and regulations for certification and recertification of engineering professionals has established the following conclusions

- Establish coordination between the actors that determine the engineer's professional quality (Ministry of National Education, Universities, Professional Councils engineering, industrial sector) that energizes the professional certification process in Colombia.
- Replicate the certification processes of academic programs to encourage recertification granting the importance of engineering activity.
- Carry out a review of professional standards in Canada and the United States with Colombian professional standards and adapt professional license for those engineering activities that may infringe on the integrity of the individual and the monetary loss of goods and services.

These findings provide inputs to develop the methodology for project. Also establish elements justifying develop a model which consists of making the analysis of different models applied by certification bodies for qualifying engineering professionals and determine the validation criteria for the qualification and professional qualification.

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Biography

Oscar Vásquez Bernal is an Assistant Professor in the School of Basic Sciences, Technology and Engineering at Universidad Nacional Abierta y a Distancia _UNAD, Bogotá Colombia. He earned B.S. in Industrial Engineering from Universidad Antonio Nariño, Colombia, Masters in Business Administration from UNAD Florida USA, and PhD (c) in Engineering from Universidad Nacional de Colombia. He has published journal and conference papers. Professor Vasquez has done projects with manufacturing and engineering companies. He is a Management Consultant in Quality Assurance, Project Manager, and Safety Management. He has taught courses in entrepreneurship, strategy and corporate logistic and innovation for engineers. His research interests include certification, accreditation, multicriteria decision analysis, and optimization. He is member of NFPA and IEEE.