

RBE – BRAZILIAN ENGINEERING NETWORK, FOSTERING SUPERIOR EDUCATION IN THE COUNTRY

Claudio da Rocha Brito¹, Melany M. Ciampi² and Ricardo C. Molina³

Abstract $\frac{3}{4}$ This work has the goal to show a very new and interesting effort to foster Engineering Education in the Country, making use of the last technological acquisitions available in the world market. The organization responsible for this initiative is the RBE, which means “Brazilian Engineering Network”, that has began its activities in March of 1998 with a first meeting in São Paulo state. Since then, it has been working to accomplish its mission, which is to collaborate with the dissemination of knowledge over the Country, with the project of what has been called “Technological Virtual University”, the UTV (Universidade Tecnológica Virtual). It is an ambitious project conceived by some professionals of Engineering who have a large experience, vision and an eye in the future. It is a project that has the support and the involvement of many Universities (private and state ones), from the several states of the Country. For Brazil, it means the improvement of the previous experiences with distance learning reaching now the status it really deserves.

Index Terms $\frac{3}{4}$ Mercosul, ASIBEI, Rio de Janeiro Declaration, cooperative program.

INTRODUCTION

It is known that any technological innovation has an incidence in environment and the values systems of a society changes in an unpredictable way by the techniques that men introduce for social use. The present technological society requires the access to the resources of the planet with no independent or autonomous Nation or organization. The technologies operate in global scale and the operating aspects of them are the same everywhere, the same “modus operandis” for telephone, computer, diagnostic instruments, dental materials, etc. It is one of the main characteristics of the so-called global world, which has been possible because of the advancement of science and technology, principally new materials, biotechnology and microelectronic. The impacts of these scientific and technological achievements have been profound in health care, for example, changing deeply the medical practice. They have also been fostering the communications at a level never reached before, so that the world has become a small planet, where things are happening and they are showed in real – time. The

knowledge is also distributed and it becomes necessary a quick dissemination of them, anywhere, any time. With the development of microelectronic presently people and organizations can count with true powerful systems of information dissemination. Fortunately for Education communication technological achievements has also had an extraordinary impact. The Distance Learning is another example that has become a legitimate path to educate people in a large scale, with quality overcoming the problem of distant places of big centers. This is mainly important for remote places of the planet and for large Countries. Anyway, this has been an extraordinary opportunity for humanity to overcome education issues. Brazil is one of the pioneers in distance education starting its activities in the 40’s. And SENAC one of the largest education institutions has played an important role in this process, developing projects in joint venture with the Federal Government, all projects developed by radio, TV and lately by Internet. Since then until today, many efforts have been succeeded South America considered by many policy and social scientists as part of the “invisible Continent” (the Latin America) has 13 Countries with deep different colonization processes and that in many ways is also a huge economical market, big enough not to be despised. It is a continent which historically the colonization of the Countries were very different and in the same way the development of Science, Technology and Education. Added to that the different Countries’ Government of this very South part of the Americas has the challenge to guarantee the development of the Countries in a reasonable level. The task is not an easy one once the global economy for developing Countries is pushing the poverty to very high levels. Despite all the issues this Continent has been facing, the efforts to overcome them have started and the Mercosul is one of them.

This work contains the analysis of Engineering Education in South America under the Mercosul new paradigm (social, political and economical), for the four Countries that are part of it. It is important to see the present status and the perspectives for the future of the Economical Bloc and the targets to make it work for the welfare of future generations. It is also important to discuss is the lately efforts of Universities from Iberia Peninsula Countries to promote cooperation programs between them and Universities from Latin America Countries through the

¹ Claudio da Rocha Brito, SENAC School of Engineering and Technology, Av. Dr. Eptácio Pessoa, 248 - 33, 11.045-300, Santos, SP, Brazil, cdrbrito@lusiada.br

² Melany M. Ciampi, SENAC School of Engineering and Technology, Av. Dr. Eptácio Pessoa, 248 - 33, 11.045-300, Santos, SP, Brazil, melany@lusiada.br

³ Ricardo C. Molina, SENAC School of Engineering and Technology, Av. Dr. Eptácio Pessoa, 248 - 33, 11.045-300, Santos, SP, Brazil, rcmolina@sp.senac.br

Engineering Organizations of what is called Iberian America. The Iberian-American Association of Engineering Education Institutions (ASIBEI) and the “Rio de Janeiro Declaration” as a first step for an integration of Engineering Programs curriculum and the improvement of projects development in joint venture. The relevance of this analysis is the importance of engineering for the development and progress of a Country, in a context of global society where new and very high technologies dominate the world and when more than ever it becomes necessary the formation of more qualified professionals. It is equally important to mention the determination of Universities and Colleges in the accomplishment of its mission of forming a new engineer prepared to face the new world work market The RBE is one step further in addition to the Engineering Education cooperation projects in South America.

GLOBALIZATION ASPECTS FOR DEVELOPING COUNTRIES

Before describing the Mercosul it is important to have a look to some important aspects of the so-called Globalization.

In a global world where frontiers between Countries have been putting down to facilitate the action of big international corporations, the formation of economical blocs to protect the interests of companies installed in the regions became of crucial importance. In a first moment, the existence of commercial interests were fundamental to promote the union of many Countries, by the other hand this integration became possible only by means of governmental actions. As one of the results, strong governments can negotiate in better ways with big Corporations forcing them to accept the conditions even the ones against their interests. The idea of union to fight for better and fairer conditions to the people is the main goal of the economical blocs that have risen all worldwide, or at least should be.

In the same way that world economy grows up with integration the human problems grow up too. Problems like environmental catastrophe, international drug dealing, large migration of people from poor Countries to the rich ones, are all problems that cannot be solved inside the borders of a Nation.

May be the concepts have not been digested yet and it seems that despite all efforts of some groups of people against the idea, in many Countries, there is no way back. The integration have very positive aspects once it will provide better quality of life besides the freedom of coming and going, people can move to other Country to work there and a higher level of respect to others culture and habits will be necessary The cultural exchange can be considered also as one good result of the integration of Countries and regions.

THE MERCOSUL

After Cold War the strategic importance of Latin America has decreased and lately there is no reason for central capitalist Countries to worry about the future of this region. Besides the products made in these Countries were not competitive in terms of quality and price and the same situation about workers and natural resources.

In this new world order the formation of Mercosul became of great importance for the four involved Countries: Brazil, Argentina, Paraguay and Uruguay. Mercosul will bring up important consequences for consumers and enterprises of the South Cone such as the enterprises of the region can protect themselves from others outside; the enterprises of the Bloc can associate to each other to improve the quality of goods and services and getting lower prices; they can have a larger consumer market. These are among others the immediate good consequences of this commercial integration. This is an economic bloc closer to the European Union; it is an economical – commercial project that is also a political project. The union process was conceived and developed considering gradual changes so that they do not provoke crises or difficulties for none of the four Countries involved.

Mercosul has a history that dates back to the 50's; many endeavors of integration took place and the first two ones were the ABC – Argentina, Brazil and Chile Pact and the Managua Treaty. In the 60's the ALALC, which was the Latin America Free Commerce Society and in 1969 the Cartagena Agreement or Andes Pact was signed. And finally the Latin American Society of Interchange the ALADI that has substituted the ALALC in 1980. But neither the Capitalists Central Countries nor the Big Corporations had interest in the integration of Latin – American Countries and so all the endeavors have failed.

In the new millennium scenario Mercosul has raised as an important step to guarantee the growth of economy, development of science and technology and to get strength to face the global economy which incidences are very strong in all levels of citizens day by day life.

Since January 1st 1995 Mercosul is a reality although a free market will exist only from 2006 on as it is predicted in Ouro Preto Protocol.

For good or for bad the Mercosul is a reality that is still working despite the deep differences between the four Countries. For the future it foreseen a more integration in many levels and similar education system is one of them. Many discussions have started to find a way to get this goal and as a first concrete step in Brazil for example, in high School students learn Portuguese and Spanish plus the option of another foreign language.

SOME DATA ABOUT MERCOSUL COUNTRIES

The countries of South America have individual strengths and weaknesses in different industry sectors, Gross National Product (GNP) structure, education systems, political and

social structures, competitiveness, productivity and quality of life [01].

Mining provides materials that are manufactured into useful products and Agriculture creates value and sustains life. However, the manufacturing component of the food industry adds the greatest value to products and generates highest prices which include canning, freezing, cutting, storing, drying, blending, baking, cooking, packaging and distribution. Manufacturing provides the tools, equipment & supplies to enhance the productivity of agriculture.

Brazil GNP is US\$ 767.568 million and GNP/capita is US\$ 4.630 with a population of 166.113,000; Argentina GNP is US\$ 290.261 million and GNP/capita is US\$ 8.030 with a population of 37.032,000; Paraguay GNP is US\$ 9.172 million and GNP/capita is US\$ 1.760 with a population of 5.496,000 and Uruguay GNP is US\$ 19.960 million and GNP/capita is US\$ 6.070 with a population of 3.278,000. The total of the union in numbers is GNP US\$ 1.086,961million and GNP/capita US\$ 20.49 with a population of 211.919.000.

Notice that the 2001 Britannica Book of the Year; 1998 data. Comparing to the European Union, the population is close to the 380,587,609 with a GNP of US\$ 8.482.988 million and GNP/capita of US\$ 24.312. The major challenge is to enhance the GNP that could be achieved through a major enhancement of the contribution of the manufacturing sector to the GNP.

MERCOSUL AND EDUCATION

The promotion of an education system very similar, which goal is to form a professional capable to insert and to maintain her/him in the work market of the four Countries of the Bloc are part of the Education plans for Mercosul [02].

It is an ambitious goal but not impossible despite they have different educational systems besides the political and social challenges peculiar to each one.

In other words the objective is to get the young population educated in Schools of one Country having the diplomas valid in other Countries so that they can work effectively in their profession in Brazil or Argentina or Paraguay or Uruguay [03].

The plans go further and they consider the cooperation in the development of research in nuclear energy and mutual assistance in case of accident; the creation of studies centers of scientific research in economy and biotechnology [04].

ENGINEERING EDUCATION UNDER THE MERCOSUL PARADIGM OF EDUCATION

The supremacy of information and the knowledge are widely preached, the formation of a professional becomes a crucial factor for success [05].

The new paradigm imposed by the Mercosul and its perspectives for integrated education preaches that the capital is the intellect and people are the most important, but

by the other hand it is still difficult the total absorption of this new model of development [06].

The characteristics of Mercosul formation as something decided and organized from up to down, where none of the four Countries' peoples were consulted, aided to the historical motivations have an incidence in the way things are treated. The whole conception has not been completely understood by the people but those who have knowledge and Education can understand that it is good for everyone. In Education field the Mercosul was conceived predicting similar educational system and so not so sudden there are new laws dictating new adjustments and Schools have to adapt to new situations. It takes time and operating staff qualified to reach this target. In Superior Education the adjustments happen slower once the goals and results have deeper consequences not only for education but also for economy [07].

So following these new trends the engineering education institutions in Brazil are, kind of running fast to form a new engineer. New programs have been conceived, new approaches, new laboratories and so on. Changes have been happening and many of them are successful [08]. And despite all the efforts it is not possible to say that any Country of Mercosul is forming an engineer to work in any other Country once the challenges are of huge dimensions [09].

THE ENGINEERING EDUCATION ORGANIZATIONS OF IBERIAN-AMERICAN

The part of America which colonization was made predominantly by people from the Countries of Iberia Peninsula is called the Iberian-America.

Although the historical process of colonization had been different in the Countries, the influence from Europe in almost every field of culture and education is very strong yet.

Aided to the Mercosul efforts to promote similar educational system in the four Countries that are part of the Bloc, there is also the endeavor of a new approach to Engineering Education promoted by the Iberia Peninsula Countries. The goal is to enhance the cooperation programs and collaborative projects between their universities and the ones from Latin America.

ASIBEI that means Iberian-American Society of Engineering Education Institutions, has risen in November 4th, 1997 during a meeting in Madrid, Spain of the Iberian-American Engineering Institutions representatives. It was created with the goal to promote a higher integration between the Engineering Educations Institutions of Latin America and the ones of Iberia Peninsula. In fact it was an initiative of Spanish Engineering Education Institutions with a view to the future internationalization of education in the world.

The primarily goals were to promote the experiences exchange between universities and the generation of

common actions to enhance and develop the engineering education in every Countries and the research for the establishment of strategies to get solutions for the betterment of engineering education. In a second moment the works were about the development of: the engineer formation considering the engineer profile and market needs; possibilities of a curricular unification; the discussion of methodology aspects; the evaluation of professional formation and experiences and the relationship university/enterprise.

The ASIBEI also consider the support of international recognizing processes of titles and professional diploma based on similar minimum curricula content.

The biannual meetings of ASIBEI have been kept through the six years and some results have been achieved [10].

THE “RIO DECLARATION”

In Rio de Janeiro during the last meeting of ASIBEI, on November 2001 the works were around the accreditation systems and the new engineer profile. These discussions led to what was named “The Rio Declaration”, which consists in some guidelines for future conversations about collaborative programs.

The guidelines preach three main characteristics of the Iberian-American engineer for the XXI Century. The first one is the achievement of strong knowledge about basic sciences; the second one is the importance of a generalist formation and the third one is the necessity of forming an engineer with social concerns. They are the result of an intense discussion about the globalization and its influence in education, principally in third grade education in almost every part of the planet.

The statement of these characteristics was unanimous and had the support of the majority of educators present in the meeting. It is of fundamental importance to keep the collaborative process between the engineering education institutions involved in the efforts of ASIBEI. Integration has been considered as an important target to the institutions of both side of Atlantic Ocean and nothing better than to not to have the barrier of language.

FUTURE POSSIBILITIES OF INTEGRATION

Engineering for any Country and principally for developing Countries is of high importance because engineers are the great protagonists of the development of science and technology. Engineers are responsible for the transformation of an idea in goods and services. It is engineering that studies the technical and economical liability designing and implementing physical installations and depending on the case, operates them. In other words the technology produced by research and experimental development have to be engineered to get to be used by the productive system.

At the moment it is not possible to predict the future of the discussions and experiences in the field of engineering

education under the perspective of a more integrated system between Countries of Mercosul Bloc and Latin America and Iberian Peninsula Countries. Both initiatives have brought up new perspectives to the engineering education in these Countries principally because of the necessity to restructure the university education that is the responsible institution for the formation of professional that will act in the work market, developing science and technology for the welfare of society.

Analyzing the Mercosul one of the principal obstacle is the different reality of the four Countries in social, political and economical level, besides the constant interference of central capitalist Countries with the goal to weaken the Bloc, like in the past.

In Brazil like many Countries there are three different conceptions of universities that were born in medieval age, the one with tutors and advisers, which is a community of masters and students. A second type of university exists for science that is in service of the good and the beautiful. And a third one that is the functional university that contributes to the social-economical development. About the Engineering Schools they follow the Swiss model of ETH Engineering School with some exceptions that follow the French model. Lately some changes have occurred to supply the present market demands. Although in the other Countries the systems are similar the content of curricula are different and the time of program varies like in Argentina that takes six years to form an engineer contrasting five years in Brazil [11].

About ASIBEI efforts there are many reasons to be taken into account. There are barriers to be overcome the social, political and economical reality of the Countries involved allied to the necessity to create a work market for the Spanish engineers; the North America growing influence in education model; the internationalization of superior education with French-Brazilian Diplomas.

CONCLUSIONS

The main goal of this work is to show some of the most important aspects of Engineering Education in South America: the origins, cooperation and education policies, the differences and difficulties of engineering programs integration and the perspectives for the future. It is a continent that has entered new millennium facing huge challenges imposed by the global society immersed in what is called post industrial era. In this scenario is Mercosul, the economic bloc that has emerged in the 80's and that plays an important role in the fostering of integration between the four Countries of the south cone (Brazil, Argentina, Paraguay and Uruguay) that are involved in the process; its history, its achievements, the difficulties, the cultural differences and present status.

Third Millennium is coming and bringing to Education changes as natural consequence of world's transformation.

New social, economical and education paradigms have emerged although they are not consolidated yet.

The XXI Century engineer has to be very well qualified, with skills to help the promotion of sustainable development. S/he has to be a professional with scientific mind, capable of finding solutions in according to the local context inserted in a global context. It is the ability of creating technology to be used to the welfare of contemporary society, viewing the future year [12].

The engineering programs under the Mercosul paradigm of education have the goal to prepare the students for the effective professional practice in a more solid way, coherent with the complex demand of present and future world, in the four Countries involved in the Bloc.

In Countries like Brazil and its partners in Mercosul, more than ever it is necessary to increase the number of researchers, committed with environment principally because this Country has an immense challenge to defeat: to promote development for the welfare of people without forgetting the human aspects involved in the relations - man, progress and nature. So it is imperative the creation of alternatives for the qualification of scientific minds to make science and create technology for the welfare of the four Countries people. This is an ambitious project that consists in a proposal of similar education systems.

University has an important mission that goes through the centuries, from past to future, passing through present. This mission is essentially the conservation of cultural inheritance generating ideas, values and knowledge. This same University has to defeat the challenge of present world and to serve to the contemporary society viewing the future.

The most important point of this work is its wide dimension that becomes it complex and fascinating in some aspects. The characteristics that are peculiar to a Continent that is a mosaic of culture and races are the ones that make it a rich experience for humanity. RBE has an important task that is to improve the engineering education in the Country taking into account the new policy and the new paradigm imposed by the lately happenings in South America integration and with the inclusion of Iberian Peninsula Countries cooperation programs.

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