

# Engineering Programs for Engineers-A global Higher Education Perspective

*Victor F. A. Barros*

Executive Secretary  
Science and Education Research Council - COPEC  
Braga, PORTUGAL  
victor@copec.eu

*Melany M. Ciampi*

President  
Safety, Health and Environment Research Organization  
São Paulo, BRAZIL  
melany@copec.org.br

*Claudio da Rocha Brito*

President  
Science and Education Research Council - COPEC  
São Paulo, BRAZIL  
cdrbrito@copec.org.br

*Rosa M. Vasconcelos*

President  
Pedagogical Council of the School of Engineering  
Guimarães, PORTUGAL  
rosa@det.uminho.pt

*Luis A Amaral*

President  
Computer Graphics Center - CCG  
Guimarães, PORTUGAL  
amaral@dsi.uminho.pt

**Abstract** — New demands for engineering education are taking place due to the deep transformations that the world is facing. The way to overcome the constant mutation and challenges that engineers have to face professional programs are dimensioned in accordance with the knowledge and practice that are necessary for the group of professional engineers. These are the customized courses. Students make the requirements and the program is designed to fit their needs. Briefly, classes are in classroom with technical visits to different organizations and the content is available on line. The amount of work comprises the amount of hours that are necessary to accomplish the program focusing in the main goal, which is to have a certified course of specialists in a certain field of expertise. The proposed program is an investment that guarantees return by the strategic vision for a successful performance, the higher management capacity and growth of intellectual capital.

**Keywords** — *professional skills; global vision; leadership; innovation; program on demand*

## I. PROBLEM FORMULATION: NEW WAYS OF PERFORMANCE REQUIREMENTS

Professionals today live and work in a challenging environment in all aspects including educational. It is a fact that education is important once it provides men the tools that are necessary to act in a world of high technology and real time information availability. It is a scenario that was almost impossible to foresee not along ago. In times of high-speed communication and real time information delivery information

technology in its entire spectrum has become very important for companies and professionals. It is science that now provides the environment for new technologies application in educational community [1].

Taking into account these new trends of higher education, which is in fact life long learning, the International Institute of Education is offering courses in engineering that are customized not only for enterprises but also for groups of professionals interested in acquiring special knowledge with a valid certification [2].

The proposed programs have been dimensioned according to the knowledge and practice that are necessary for the group of professional engineers or academia. They make the requirements and the program is designed to fit their needs. The classes are in class and some content is delivered on line as long as it comprises the amount of hours that are necessary to accomplish the program focusing in the main goal which is to have a certified course of specialists in certain field of expertise [3].

## II. 21<sup>ST</sup> ENGINEERING FORMATION PARADIGM

Probably the most challenging task for the new engineer is to learn how to develop some competencies in order to be competitive and achieve success in the career.

Besides having the solid knowledge about her/his field of expertise, the engineer is expected to have some competences such as:

- Interpersonal skills, which mean to be able to interact with colleagues in international teams;
- To be capable of developing a collaborative work environment;
- Leadership and ethical behavior that shows respect;
- To have open mind for innovations and to accept new ideas;
- Global vision and capability of create conceptual models as a competitive differential.

The technical immersion program proposed by COPEC has been designed in order to provide opportunities for the development of these skills.

### III. SOME DISCUSSIONS ABOUT ENGINEERING FORMATION

Nothing has defeated the power of knowledge and it still can make a difference in people's life. It is true not only for personal life but also for professional life. A successful career nowadays implies firstly, opportunity, secondly, the capability to envision the possibilities, thirdly, the decision-making process development, and finally the excellent performance. This is a concept that has to be in mind of those who want to work in the global work market in which any professional has to live if they want to succeed.

At present knowledge means not only to know how but also how to get the know-how. This is a key factor to be able to take acquired knowledge and also new information widely available in virtual world of Internet as well as social media that are now playing an important role and to develop a performance style good enough to be adopted.

Another aspect is the need to be willing to come back to the classroom, on line or not. It is important to have in mind that a bachelor degree is the starting point of a professional career and that it does not end with a job. Talking about jobs, it is equally important to think about the possibility of self-employment once the positions in companies have a character of evanescence and both good and poor quality professionals are being laid off despite their quality because their work is no longer necessary. This refers not only to practical work performance but it is also valid for projects and application of sciences in the work, due to the technological development that is reaching sky scale replacing men work.

The previous ages in which there was a discrepancy between what was learned at the university and what was actually required of graduates once they start work have been roundly criticized. This scenario persists and it is hard to find ways to solve this problem once technology has been developed in a very fast way contributing to the rapid obsolescence of work systems.

Doctoral program trains people in many important skills, but certainly not in all, because it is aimed at increasing scientific knowledge, as well as science and technology

development while the areas of activity in a company are obviously different. No matter the field of expertise in engineering or whether it is an academic or company career, nowadays the professional needs to pursue constant knowledge updating [4].

A solution to decrease this gap is the offer of short programs, offered by education institutions in classroom or on line, just to become aware of what is new and what can be applied in practice. Strategically it is a very good solution for professionals in order to be aware of what is up and new and the achievement of new skills to keep up active in market.

This is a reason why on demand programs are optimal for this purpose. They are designed according to the necessary knowledge and practical performance in different areas, dimensioned to reach the participants expectations in terms of qualification, information and new practices.

### IV. METHODOLOGY: ON DEMAND INTERNATIONAL PROGRAMS

The international program designed by the engineering education research team of COPEC - Science and Education Research Council and offered by its International Institute of Education that includes lectures with leading experts in the country in their areas, as they are professionals and teachers from the most reputable universities in the country. Classes are extremely dynamic and taught intensively with selected content and according to the latest educational theories and practices given the globalized market. All content is available online for participants, which enables them to take the most of explanations while in classroom without worrying with taking notes.

It is an international course and high quality professional development in Europe and it is a response to growing demand for the challenges of the current context of the education institutions. This constitutes a great opportunity for professionals to expand their intellectual horizons, and acquire valuable intellectual and intercultural skills in a learning environment.

The program is also offered in Brazil following the same trends and with the same quality. As it is an international organization it is possible to develop the programs in different countries.

The idea is to have a group of minimum 15 participants per class and maximum of 25/30 participants, which is ideal for the good accomplishment of the program.

The international program consists of an opportunity to take a "Plus" for the formation of professionals in engineering, providing an excellent course from the point of view of formation/qualification and a great experience in international educational and entrepreneur environment [5].

### V. ADMISSION REQUIREMENTS

After a long discussion about the participant's background necessary to enroll the programs, the candidates' requirements for admission are:

- Candidates should have at least bachelor degree in any field of engineering;
- Professionals with other backgrounds are considered based on their interest, formal education and professional experience;
- Willing to dare to do something different.

## VI. PROGRAM DETAIL

The program has been designed for a multidisciplinary formation, introducing the site, know some European culture, touring to many politicians, academics environments and business units in different countries of Europe, developing technical activities, exploring the history and experiencing the local public services [6].

Participants will visit class organizations, typical European universities as well as businesses. The cultural part of the program includes guided tours, historic centers, museums, and other related activities.

The classes include lectures with leading experts in the country in their areas, as they are professionals and teachers from the most reputable universities in the country. Classes are extremely dynamic and taught intensively with selected content and according to the latest educational theories and practices given the globalized market. All content will be available online for participants. The proposed program consists of an opportunity to take a "Plus" for the formation of professionals in engineering, providing them an excellent course from the point of view of training and a great experience in European environment [7].

## VII. MODULAR SCHEDULE

The schedule follows an example of a program schedule designed for a group of civil engineers, whose interest was to acquire knowledge in European style of civil engineering development not only in technical terms but also in terms of business administration.

The richness of the program is in its content that fits the necessity of the group, which will get the knowledge and the certification according to their requirements. Besides they also gain from all the networking that they will be able to do in Europe, which is a plus for their investment of time and financial resources [8].

TABLE I. EUROPEAN STYLE OF CIVIL ENGINEERING

MODULE 1	MODULE 2	MODULE 3
<b>Welcome Class and Program Content Presentation</b>	Aspects of Urban Rehabilitation	Public Policy in Global Scenario
<b>Threaten Social Network</b>	Modal Systems, European Model,	Organization and Process Management
<b>Use of technologies in the area of Business</b>	Strategic Urban Plans	Negotiation Strategies and Techniques
<b>Creativity and Entrepreneurship</b>	Relevant Aspects of New Renewable Energy	Strategic Negotiation

<b>Geopolitics and Sustainability in Business</b>	Urban Sustainability	Technology, Knowledge and Innovation
<b>Technology and Development: Cause or Consequence.</b>	Management of Environmental Issues Strategy.	Urban Sustainability.

## VIII. PROGRAM GOALS

The main program target is to provide participants the required knowledge for a competitive performance in their field of expertise, as well as the acquisition of tools to work in global environment.

After accomplishment of program the participants will get:

- improvement of professional skills;
- understanding the role of agent of changes within the organization;
- full development of analytical and critical thinking synthetic;
- experience of different cultures;
- strengthening Career Goals;
- global Experience;
- development of vision for new opportunities;
- enrichment of working life;
- aggregation of values [9].

## IX. EXPECTED OUTCOMES OF THE PROGRAM

As these are programs on demand there are some general aspects that should be observed after the accomplishment of the program.

Taking this in mind, at the end of the programs the participants will have acquired:

- dynamism for career;
- technical expertise and global knowledge;
- experience of political and economic scenarios in different cultures and histories;
- development of skills in tasks relating to planning, coordination, monitoring, implementation and evaluation of the actions undertaken by organizations;
- valuing career [10].

## X. FINAL CONSIDERATIONS

In the current world scenery, qualification of a professional must take into account not only technical and scientific formation, but also the development of other skills such as communication, working in teams among others and the awareness of "lifelong learning". When we consider effective education, it is important to also have in mind the knowledge of different cultures, because modern life has undergone a process that is known as globalization, which demands new

professional performance that is defined as "global mind set and local action".

With more than 12 years of research in the field of engineering education, the education researchers of COPEC – Science and Education Research Council have been developing cutting-edge research in the area. By means of its International Institute of International Education it is offering courses in Engineering field with an international experience approach.

The International Programs in Engineering offered by COPEC IIE are technical/cultural, international 10-day immersion programs designed to professionals seeking constant update knowledge in their fields. It has been a successful program that is growing once it offers programs dimensioned to attend the necessities of professionals in engineering field in order to improve their careers as well as the constant updating in practice.

The programs proved to be an investment, which guarantees return because it provides, among other skills, update information, a more strategic view, a successful performance, greater capacity to manage, the growth of intellectual capital and a better preparation for future challenges.

The COPEC IIE programs are the result of a research developed by an international team in the field of engineering education targeting the formation of engineers for a more strategic career development.

Maybe the main aspect of these programs is that they in fact are an introduction to professional learning that can enable the engineer to shape a better career development. It is a way to be aware of global perspective that can be integrated within their performance and encourage them to reflect on ways to understand world issues and local actions.

Due to the feedback from the participants the courses have been very successful with more than one year of accomplished programs.

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