

“Innovative Office”: Building Future for Young Engineers

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Abstract — This paper shows the course designed by COPEC – Science and Education Research Council education research team, for engineering students what is called “working with communities course”, which provides the students of engineering in 3rd year the chance to work with consultancy for the entrepreneurial community, in the region. It is for an engineering school of a private university and the goal is provide the needed resources to enable interdisciplinary efforts to prepare engineering students to tackle real-world challenges in engineering, entrepreneurship and new business ventures as professionals. The process is designed in order to offer a space that has been named after “innovative office”, where local entrepreneurs go with a problem or project to discuss and to find sustainable solutions under the consultancy of young engineers. So far the program has been working well and is opening doors for young engineers.

Keywords — *Entrepreneurship; sustainable solutions; project development; innovative office; working with communities.*

I. INTRODUCING

At the present engineers with technical skills must also learn how to work in interdisciplinary teams, how to develop designs rapidly, how to manufacture sustainably, how to combine art and engineering, and how to address global markets. It is imperative to provide future engineers opportunity in the work market has become now part of university formation, as a way to assure also the future of university. Enterprises and universities have still in many places difficulties in working together, it is up to the engineering schools and universities to have the initiative to enhance their programs, to assure the proper formation for future professionals that can perform in this mutant work

environment of 21st Century. In accordance with the National Academy of Engineering, USA report “The Engineer of 2020” paints a picture of a dynamically changing and evolving world: “The successful future engineer will need strong analytical skills, practical ingenuity, creativity, good communication skills, business and management knowledge, leadership, high ethical standards, professionalism, dynamism, agility, resilience, flexibility, and the pursuit of lifelong learning”, the report says.

Presently the opportunities for professionals seem to be very narrow once economic crisis is impacting countries and communities worldwide, as the result of a natural cyclic wave of economy until a new economic model starts to work somehow. To provide future professionals an opportunity in the work market has now become part of university training as a way to assure the future of university.

This paper describes a course designed by COPEC – Science and Education Research Council education research team, for engineering students which is called “Working with Communities Course”, providing 3rd year engineering students the chance to work with consultancy for the entrepreneurial community in the city. The goal is to offer a space that has been named “Innovative Office”, which local entrepreneurs can refer to with a problem or project to discuss and to find sustainable solutions.

Engineering students then work using their creativity to design and present solutions within the constraints of ethical practice grounded in science and engineering methods and standards. The process involves face-to-face meetings and discussions with entrepreneurs of the city, from the presentation of the problem until the delivery of the plans.

Once engineers are part of society it is important that they have a stronger interaction with the wider public. So the goal of including this course in the program is to provide students the opportunity to work closely with the real local entrepreneurship environment. Apart from this, engineers need to develop broad fundamental understanding of their professional responsibilities as well as the need to be entrepreneurial in order to understand and contribute in the context of market and business pressures. If engineers can work with the public to explain how engineering can help address their problems, and to help them to decide which are the most effective and affordable ways to address their concerns, the community can make great progress and improvements. It will surely be a great acquisition for the city business community as well as for the students themselves, once they can get a glimpse of what it is to engineer in real world. This project is being developed in partnership with a City Hall as a way to improve entrepreneurship in the region, aiming at fostering employment and private initiatives to change the community's profile.

II. DISCUSSIONS ABOUT EDUCATIONAL ASPECTS

New work environment takes place worldwide and today millions of professionals are also unemployed, even in advanced economies. On the other hand, businesses in advanced economy countries claim that they often are not able to find workers with the required skills. It is a fact that this is a symptomatic dysfunction due to the structural changes that are transforming the nature of work and reshaping employment opportunities. This shows that organizations and policies are not keeping up with the changes in business practices and new technologies that are defining what kind of jobs will be created and where they will be located. So there is a need for companies to redefine how and where different tasks have to be carried out requiring new skills and new employer and employee relationships [1].

Another aspect is that globalization has been expanding access to low-cost talent professionals and creating a greater need for workers with higher levels of education and specific skills in order to perform in advanced economies. Under skilled workers are disappearing due to automation and low-cost labor market abroad. In this world scenario, education and training should be seen as vital economic priorities by governments. However, it is still possible to observe the neglect of some nations, perhaps due to lack of political interest other than electoral. Although governments need to invest in the entire system that builds workforce skills, in some places it is up to private initiatives to offer opportunities for young ambitious talented professionals, who can cooperate for a better future of generations to come. There is no better place than universities to offer these opportunities, pushed by the enterprises. It is important for nations to train highly skilled native-born citizens as well as to attract highly skilled immigrants in order to be competitive in a global scale and assure a future for the people [2].

Finally, govern agents should be aware of the fact that if there is no production system there will be no financial resources to maintain social assistance system. This idea of an innovative office will help generate more quality services for the betterment of service industry as well as the productive

system generating opportunities and generation of jobs, which is a need everywhere in the world today [3].

III. COPEC: SCIENCE AND EDUCATION RESEARCH COUNCIL

COPEC's history started with an idea shared by some scientists of creating an organization to foster the research mainly in sciences and education. This idea seized larger proportions and after some meetings the Council became reality. This is a group of scientists, professors and professionals whose vision of future has driven them to start this work.

The main mission of COPEC is to promote the progress of science and technology for the welfare of humanity. Through its activities, COPEC maintains relations with universities, institutions of education, enterprises and the society of several countries for the discussion of sciences, technology and education directions. COPEC - Science and Education Research Council has been very active and has developed many achievements of great importance for the Country in which it is located. The Council is an organization constituted by scientists of several areas of human knowledge committed with education and the development of science and technology.

Its members believe that education is the main beam in the construction of a better society and that sciences and technology are the main agents in fostering progress to promote the welfare of human being [4].

IV. METHODOLOGY

The whole process has been developed in steps and it required a person in charge of the project, which in this case is the professor specially hired as the Head Director of "The Innovative Office" since the very beginning. The Head Director will keep the project working and collect all data for enhancement of the process throughout its development.

The project starts with adding a course named "Introductory Economics Topics" which may include an overview of: economic theory, econometrics, macroeconomics, microeconomics, economics research methods, economic policy, game theory and mathematical methods for economic analysis. The main goal is for students to have a glimpse of economics aspects necessary to understand and boost the economic commonwealth of the region. The hired teacher is a professional who is also prominent in his field in order to attract students and enhance the quality of the program. The model chosen is the one-week intensive class about the topics, in order to provide them the basic knowledge and the means to research further information when necessary. This step will take nine weeks before the students can start their journey in the project.

The legal aspects are up to the consultancy of law office of City Hall in order to assure that some other issues related with legal actions and measures are avoided.

The research team proposes to offer this course for all engineering programs of the Engineering School of the university involved in the project, to have a critical mass of specialties to perform in the consultancy field for the

community. However students are invited to join the project, which in fact reduces the number of interested students. The key is to have really interested students involved in a first stage, so that it can be expanded to all school programs as a way to increase the quality of the program [5].

FIG I. WORKSPACE



Once the number of students interested from all the programs of the referred engineering school is established, the next step is to hold a meeting with students and define a schedule for the activities to be held at the office, located in the City Hall building which is offering this service to the community. The workspace is basically a clean, neat room with tables, chairs, computers and a telephone line.

It is up to the City Hall to advertise the service offer “The Innovative Office” to the local community. The university is responsible for providing the students and the necessary laboratories. In case a laboratory is used, a fee is charged to the consultant to cover basic material and energy. There is another professor in charge of mentoring the students’ team for a determined period as volunteer work, in order to help refining their proposed projects to their clients.

Next step is to have students working in teams at the offices, available to receive possible clients. The students welcome the client; start a professional relationship and work in order to solve the presented problem. Their work starts with a visit to the enterprise where the business takes place, collecting all data, followed by the search for ways to best solve the client’s issue. This means that they have to work hard in teams to find out “The Best Solution” for the presented problem in a “Certain Period of Time”, which the team can establish and must honor. It is a simple concept that works because of the commitment of all people involved in the process. Both the university and the City Hall are committed to provide this service for a determined period of time in a first moment and the enlargement of this service, if there are conditions for it. An agreement is signed between both organizations for a certain period, which can be terminated by mutual decision. The implementation of the project started in 2013 and the office started working effectively in August 2014, mainly due to City Hall bureaucracy.

V. DETAILS OF THE ENTREPRENEURSHIP

The students interested in the project register for economics classes. After three weeks of classes they take part in a training class and learn how to cause a first good impression with their future clients. This is followed by a period at The Innovative

Office, in the City Hall. Their work starts when they register for the project, which is an opportunity of intensive internship early in the program.

The main aspect of the project is that students have to be committed with sustainable and feasible simple solutions for medium and small business problems and as low cost as possible. These are the headlines and main idea of the entire training that they have prior the practical period.

FIG II. MEETING



Once at The Innovative Office, for a period of at least four months, students have to establish goals and work towards achieving them. Students are challenged to start a professional relationship with a possible client, leading them to be open and honest. They will start identifying a problem, and then find a theoretical background and a methodical approach to solve the problem within a realistic time frame towards the completion of the project and at reasonable expenses. This is followed by the implementation period and the refinement of procedures in order to solve the problem and deliver the project.

After the accomplishment of the project, students send a report to the Head Director of The Innovative Office to be included in both the program’s and the students’ portfolio.

VI. SCHEDULE FOR 2015/2016

The maximum number of groups per period is 5 with an average of 4/5 students each. Each group can work with maximum 2 clients in order to have a good performance once it is submitted to the availability of the students because of the classes and studies in the university. The project must be delivered at least before the end of their period at the office.

FIG III. SCHEDULE

| | | |
|------------|------------------------------------|------------------------|
| 1st period | March/April/May/June | 4 groups with 4 people |
| 2nd period | July/August/September/October | 5 groups with 3 people |
| 3rd period | November/December/January/February | 3 groups with 4 people |

It is important to have the office working all year round, so that students can choose the best suitable period. In any case, the schedule is up to the Head Director of The Innovative Office to set together with the students.

VII. OBJECTIVES OF THE PROJECT

The project objectives are essentially the development of engineers with skills to perform in the future work market especially in economics, as high skilled professionals are a demand in every country, which widens their job opportunities. The following skills are important once they are already required:

- Broad knowledge of different fields in economics;
- Enhanced research skills for researching for clients;
- Entrepreneurial skills;
- Knowledge of theoretical and empirical approaches to economics;
- Management skills;
- Solid understanding of economic practices, principles and theory;
- Strong command of economic models, tools and techniques including particular statistical techniques;
- Strong numerical and analytical skills;
- Strong oral and written communication skills, including preparation and delivery of professional, technical and non-technical reports and presentations;
- Time management skills.

At the end of the period the students will be able to understand the real economic and social impact of engineering in this century. Another target goal to be achieved is to foster among them the entrepreneurial mind to pursue other opportunities than find a job in a company [6]. Another aspect is that for the university the goal is to attract more students and enlarge the number of students in engineering programs. For the City Hall, this is another community service funded by federal government, which could be turned into votes for future elections.

VIII. PROJECT STATUS

The groups and the director of the project as a type of swot are doing the assessment of the project in order to identify the weak and strong points in order to make adjustments for future activities.

Presently the project has worked relatively well. Student groups are working hard and the results have been positive. Customer satisfaction has been very good. This information is based on the result of a research that is completed at the end of the project in participant companies. The students claim that the project is a very good opportunity to know their own limits and capabilities. The difficulties they face are related to the fact that they have to combine the project work with studying hard to accomplish the engineering program. They have provided good feedback and are working hard to finish the engineering program, certain that engineering is what they want to do in life.

The City Hall evaluates it as a good service offered to the community and intends to keep “The Innovative Office” open for another year. The constraints are related to the political environment, meaning that the project will last as long as there is political interest by the current government bodies at least until 2016.

IX. CONCLUSIONS

Maybe the best outcomes of the project are the skills that the students develop along the process in the “Innovative Office”, along the perception that they have to take risks and turn today’s failures into the seeds of tomorrow’s successes. A first result seen during this process is that the project helps the students to experience what it is to be an engineer early during their studies.

Another relevant conclusion is that they can evaluate their own performance and make adjustments. Furthermore, they develop skills such as human interaction, work in team, and work under deadlines and how really to engineer for sustainable, feasible solutions.

The pedagogical aspects of the program are the key factor for its success, which are the extra courses of economics taught by specialists and the research practice that students have to develop in order to get the basis for project development.

It is a very rich experience for students and shows them that they need to be very much self disciplined and to avoid procrastination.

ACKNOWLEDGMENT

This work has been supported by Portuguese national funds, through FCT - Fundação para a Ciência e a Tecnologia, on the framework of projects UID/CTM/00264/2013 and UID/CEC/00319/2013.

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