

# **ABSTRACTS**

## **Corporate Social Responsibility in Engineering. A learning by discovering initiative.**

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**Keywords:** Corporate Social Responsibility (CSR), learning by doing, values for engineers.

### **Abstract**

Technical universities have the critical role of prepare engineers committed with sustainable economic development (Real Academia de Ingeniería, 2009). In engineering careers it seems to be an increasing interest in including contents and approaches that prepare students to understand social and environmental effects of technologies in their curricula.

The aim of this paper is to analyze and discuss the results of an initiative (“CSR for Engineers”) to incorporate the topic of “social responsibility” in the engineering curriculum. It has been undertaken in Universidad Politécnica de Madrid (UPM), the largest technical University of Spain.

To design an appropriate pedagogical method is an essential factor to achieve the goals of the aforementioned initiative, since the consideration of values and attitudes acquires special importance. A methodology based on a “learning by discovering” approach has been developed for the designing of the initiative. It is supported on a blended-learning platform, allowing the combination of lectures, case debates and online contents.

The “CSR for Engineers” teaching initiative try to help students to understand the complex environment in which companies have to take decisions, balancing economic, social and environmental aspects. After the design of the methodology, its implementation followed several phases:

- Defining the requirements of the contents, taking into account the points of view of different stakeholders, through panels with experts. It is to be noted the support received by “Red Eléctrica de España”.
- Organizing a pilot seminar, titled “Social Responsibility and Engineering” (<http://jornadascyds.etsii.upm.es>).
- Planning and teaching the first degree subject about CSR at UPM. Thirty-eight students attended it, which is a significant number to obtain meaningful results of its performance.
- Evaluation of the initiative.

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**Nirbhay Kumar Mishra<sup>1</sup>**

**Ethical Engineering: From Self-Exploration to Social Evolution**

Scientific development and technical advancements have been the driving forces to improve the quality of life for the whole humanity. However, in the last century, if we analyze closely then we shall come to the conclusion that though we have registered many successes in the areas of science, technology and engineering but we have trapped ourselves in to various kinds of social and environmental problems. Although we cannot develop without engineering and technology, this has become the need of the hour to develop the ethical attitude and adopt the ethical measures in order to ensure the problem free human development.

Keeping this point of view intact, this paper tries to develop the notion of ethical engineering. This paper emphasizes that we need to train our potential engineers and scientists in such a way that before creating or designing anything new they will be thinking about the implications of those on the society and environment. For this reason, in this paper the concept of Value Judgment Capacity (VJC) will be philosophized. Here, VJC simply means the decision making capacity of deciding between right and wrong looking at the people and environment. However, this is important to be questioned how to develop VJC in the characters of engineers and scientists. For this purpose, this paper proposes an analytical framework which derives its logistics from the notions of self exploration and social evolution. Self exploration is the fundamental for developing an ethical attitude and it aims to evolve the society as a whole.

This paper will be developed in four stages. First, we will be developing the notion of ethical engineering. Second, we will be trying to analyze that why VJC is a presupposition for the ethical engineering. Third, we will be discussing the framework that is necessary for the ethical advancement of our potential engineers and scientists. Further, we will be trying to examine the matrix of the knowledge, skill and moral values. Fourth, adopting the Holistic stance we will be emphasizing the idea that it's not only matter what we create or design but it matters too how it improves the quality of life. The idea, that though ethics cannot create anything in this world but it can direct you to how to create something avoiding the immoral affects, has been a driving force for me to develop this paper.

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## **FORMACION Y VALORES EN LA INGENIERÍA: UNA RESPUESTA INTEGRAL PARA SUPERAR LOS FRACASOS DE UNA SOCIEDAD**

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La presente crisis económica con sus graves consecuencias en términos de desempleo y empobrecimiento de amplios sectores de la población es susceptible de ser considerada como punto de reflexión para los futuros ingenieros, seguramente llamados a desempeñar un papel importante en la sociedad de las próximas décadas. En un contexto marcado por el progreso técnico y científico y la libre comunicación y circulación de tecnologías y bienes surgida a partir de la globalización, y relacionada con la eliminación de barreras arancelarias, no parecía ni previsible ni razonable un fracaso de tal magnitud. Es por eso que los futuros profesionales de la ingeniería debemos interrogarnos sobre si la formación que recibimos es realmente adecuada para tratar de evitar episodios como el presente u otros que puedan devenir en el futuro. Es pertinente preguntarse no se está potenciando un ingeniero hiper especialista o ingeniero de anejo frente al ingeniero integral y humanista. Vale la pena estudiar si es posible el progreso sin hombres rectos, operadores económicos e incluso ingenieros como prototipo de tecnologismo y agentes políticos, que sientan fuertemente en su conciencia la llamada al bien común. Consecuentemente la formación en la ingeniería debe proporcionar respuestas a estas cuestiones.

## **GENERIC SKILL "SUSTAINABILITY AND SOCIAL COMMITMENT" AS A TOOL FOR VALUES INTRODUCTION TO ENGINEERING STUDIES**

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### **ABSTRACT**

This work collect initiatives undertaken by different sectors of the UPC-BarcelonaTech to ensure effective implementation and deployment of generic skill "Sustainability and Social Commitment", within the various undergraduate studies who have just been started teach in UPC centers and campuses.

In December 2008, from Governing Council (GC 16/12 2008), UPC-BarcelonaTech indicates generic skills selection that should be included in curriculum offered in every undergraduate study carried out in UPC-BarcelonaTech. 7 powers referred to in this agreement are: Entrepreneurship and Innovation, Sustainability and social commitment; Third language; Effective oral and written communication, Teamwork, Solvent use of information resources, and Autonomous learning.

From Education Sciences Institute (ICE-UPC), Communities of Practice creation involving this skill, has been proposed, by means of RIMA Project (Research and Innovation in Learning Methodologies, [www.upc.edu/rima](http://www.upc.edu/rima)), encompassing the following areas:

- Sustainability
- Equal Opportunities
- Values in Engineering
- Accessibility
- Cooperation

C&P constitution will allow the Studies responsible members for each center to identify, in an easy and fast way, "experts" or motivated people, in order to make easy and efficient the skill incorporation in all the centers.

As an example, skill dynamic incorporation for undergraduate studies of Aeronautic or Industrial Engineering in School of Industrial and Aeronautic Engineering of Terrassa, is shown in this paper.

# **HUMAN, SOCIAL, ENVIRONMENTAL AND ECONOMICAL ASPECTS INCLUDED IN A SOSTAINABLE APPROACH IN ENGINEERING AND ITS RELATION WITH THE ACQUIRED HUMAN VALUES**

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Generations of seniors and juniors engineers are facing in these times exceptional challenges. Deep economic crisis has removed the very roots of our financial system. Meanwhile, sustainability's concept has become a milestone in the understanding and planification of every all human activity. Related to this issue, it appears that while in one hand there has been a comprehensive and holistic development of the economical and environmental dimensions of sustainability, social and human ones with can be in the origin of that crisis are by far not properly or at least not so frequently analysed and evaluated. The reasons of this low profile approach of non environmental and non financial aspects are probably related with a lack of an accepted sense of what mankind is, or in other words, of a human anthropology. It is then necessary to build an organic body of values where items such as ethics codes, diversity, responsibility, equality between women and men, team task, aid to development and other can be structured and linked. Accordingly, this paper focuses primarily on these values without forgetting the rest, trying to preserve the desired equilibrium and common sense that society is asking for, engineers and citizens.

## **Innovation of Using Technology in Mathematics for Engineers Course**

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### ***Abstract:***

In a multi-cultural university like Texas A&M University at Qatar (TAMUQ), it's not an easy task to develop students' content knowledge and inspire a passion for the subject matter. Pre-calculus concepts such as working with functions and solving equations are essential for students to explore limits, rates of change and integrals. Yet many students have a weak understanding of these key concepts which hinders their performance. To counter such issues a series of online learning software were implemented to provide students with the appropriate resources for self-study. Hence, we have adopted various technologies among them: Black Board-WebCT for demonstrating text based materials, sample solutions to typical problems, Computer Algebra Systems like MatLab to deliver a set of mastery practice questions, WebAssign – a state of art web-based assessment system and even more ambitious undertakings such as second-life which is a virtual classroom, to improve student learning as well as the usage of Turning point technology software to keep track of students' attendance. The purpose of this study is to investigate different methods used in Mathematics classes at Texas A&M University at Qatar to help foster communication and appealing to various learning styles. The authors will address an overview of the above-mentioned technologies that can be executed in the first year calculus courses and could make learning mathematics an enjoyable experience. The students used laptops, Notebooks, iPhone, Blackberry, and smart phones in accessing their work online. The authors of this paper found the use of mixing these systems are quite useful in the management of the course activities and in the learning curve of the students. It reduced the time required to take attendance, helped in giving quizzes, and reduced the time to summarize and reviewing materials as well as receiving immediate feedback about the students' performance.

It is also worth mentioning that about 95% of the students were satisfied with their progress and easy of use of the used technology and mixes.

**“Is technology the modern philosopher's stone? The case of nanotechnologies: Ethical implications of hyped expectations.”**

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ABSTRACT

The aim of the paper is the reflection, from the researcher point of view, on the ethical problems related with the expectations established in connection with the techno-scientific and engineering advances.

As long as techno-scientific promises can deeply affect people's life plans, their preferences and thus their present conduct, all the agents involved in techno-scientific divulgation processes, from researchers to journalists have indeed a big responsibility towards public, which is not always assumed or at least not understood as such.

The reasons to and the consequences of rush reckless announcements of future solutions or possible applications of techno-scientific developments and the role that scientists, researchers and engineers play (and should play) on this will be analyzed in this paper.

Since nanotechnologies may be regarded as a new horizon of possibilities in which (almost) everything imaginable seems possible, or at least that is what is being announced to the public, this can easily mean a door wide open to exaggerated promises that people could easily transform into hyped expectations. To what extent these exaggerated promises and hyped expectations are morally relevant? The case of nanotechnologies is interesting due as well to the fact that they are currently in the early stages of development, characterized precisely by the proliferation of exaggerated promises. However, this reflection could be extended to any kind of new technology.

## **NEW APPROACHES TO ETHICS IN ENGINEERING IN THE PUBLIC ADMINISTRATION. THE ROLE OF THE PROFESSIONAL ASSOCIATIONS.**

Over the last years, the engineer's activity in the Public Administration has been concerned with ethical approaches, especially in cases in which the legal regulations presented a lack of definition or indeterminacies. It was therefore left up to the engineer's criteria to take the decision as to whether the projects and other technical documentation which were legally submitted for his/her evaluation, met the legal requirements or not.

The need to maintain the increase in the quality of life and wealth, as well as the greater social demand for environmental quality and the reduction of possible danger to the general public, together with a greater pressure to comply with all legal requirements, has established a new scenario in which the rôle of the engineer and the ethical aspects which affect him/her are essential.

The evaluation made on specific legal requirements, condition the viability or feasibility of a good number of industrial plants in an important way.

Examples of these specific legal requirements are:

- “the levels of risk affecting people outside the plant must be admissible”...
- “the measures adopted by the company must be clearly sufficient”...
- “the measures carried out are sufficient to minimize the possible environmental impact outside the plant”...

In this new scenario the engineer has to make important decisions based not only on his/her technical knowledge, but also and essentially, on sociological and ethical evaluations, in an uncertain environment and under different pressures. In this situation the engineer's moral and humanistic background is more important than his/her technical knowledge.

The above-mentioned problems, make one think as to whether the Public Administration itself, can guarantee the necessary impartiality, independence of judgement and defence of the general interest, which must always dominate its decisions.

One must also think if in the future the adoption of a more active role on behalf of the Professional Associations of Engineers should be proposed, when judging the specific decisions taken by engineers in the Public Administration.

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## **Social commitment as a generic skills in the UPC**

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Throughout the last few years, the UPC has achieved a solid and responsible positioning towards the social commitment and the equal opportunities policy for those linked to the University, thus, leaving a significant trace in several of the institutional acts carried out.

Starting from the varied legal documents available and through a participative process and later consensus of all the stratum within the university organization, social commitment, respect towards diversity and equal opportunities practice have become key elements in the development and orientation of the “Pla Director” of the UPC. Such planning was conceived as a tool, means and strategic framework of performance and reference aiming at guaranteeing the equal opportunities principle among all the staff working for the UPC.

In this precise reference framework it is planned the design, the development and the follow-up of the two sectorial plans, always following the governing principles of No discrimination, Social responsibility, Staff’s satisfaction, Cross-curricular activities, Proactivity and Inside information management.

Nowadays, the ICE (Sciences of Education Institute) is following the document “Marc per al disseny i la implantació dels plans d’estudis de grau”, where sustainability and social commitment are defined as generic skills in all the new degrees offered by the UPC adapted to the EHEA (European Higher Education Area) and is working, then, for the real integration of the social commitment as a skill in all the university curricula. Not to mention, this skill is viewed from a three-sided dimension including gender equality, disability equality and ethical values in Engineering.

In the present communication we will explain the varied activities the ICE is carrying out in this direction:

- Specific training for the design, development and assessment of social commitment in the subjects, always under the coherence criteria in terms of skill acquisition throughout the degree.
- Creation of a virtual workspace for documents and direct contact with expert professors.
- Preparation of specific documents on how to implement and evaluate social commitment in the different subjects and formative activities.

All these actions include the consolidation of a working group co-ordinated by the ICE and made up of the services and institutions that work for the equality of opportunities and for the integration of values and attitudes in the education and training of the future engineers and architects in the UPC.

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**Resumen/Abstract:**

The maritime professionals such as Naval Architects and Marine Engineers face moral and ethical dilemmas on a daily basis. Most of them are mostly technical but due to the growing complexity of world trade and the very same nature of shipping business, there are other short of issues to be considered such as environmental ones.

In this contribution the author develops an assessment of all the problems and related issues that these professionals and the profession as a whole address or potentially may address due to its daily work.

# **WOMEN IN THE ENGINEERING PROFESSIONS IN THE PHILIPPINES**

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For the women of the Philippines today, they are fortunately empowered by the Philippine Constitution (Art II, Sec 14 of Declaration of Principles) and the various laws. It is also a state policy to recognize the role of women in nation-building and ensure the fundamental equality before the law between men and women. This is embodied in Republic Act No. 1792 known as “Women in Development and National Building Act” and other laws that protect and safeguard the rights of women.

The Philippines, composed of around 7,200 islands that are grouped into three: Luzon, Visayas and Mindanao, supports a population of almost 92 million Filipinos with almost equal female and male population ( 45.9 M and 46.4 M, respectively) as of March 2009.

From this population, the female in college undergraduate is 10.3 million while the male is 9.8 million. In the senior college and higher education, female also dominates the male, 5.5 million against 3.9 million. The usual fields for female are the medical and allied sciences, while the male is engineering and technical programs.

Presently, women taking up engineering degrees are challenged to take up the said field as there is a stiff competition in other professions dominated by the female population. Although women are aware that engineering is denominated as a masculine course, they are not deterred by this traditional perception of the majority of Filipinos. In other words, stereo-typing the engineering profession as a man’s world is now passe’.

The trend today is for exclusive schools for both male and female students to accept male and female students. This trend also true for the different colleges and universities offering engineering programs, although they limit enrolment of women in the different engineering programs: aeronautical engineering, agricultural engineering, chemical engineering, civil engineering, electrical engineering, electronics engineering, geodetic engineering, mechanical engineering, metallurgical engineering, mining engineering naval architect and marine engineering, sanitary engineering, computer engineering, industrial engineering, and manufacturing engineering.

Please note that In the early 1950s to 1960, the female students in the engineering schools are the minority and most are enrolled only in Chemical Engineering. Now the female students have invaded all the disciplines of the engineering programs. However, the percentage of female enrolled in engineering is only about 25% of the male population in academic year 2004-2005. But In the higher education (post-graduate) of engineering, the female population is about 50% of total male population as reported in a paper entitled, “Women in Science and Technology”.

It is interesting to know the performance in the licensure examination given by the Professional Regulation Commission (PRC) of female engineers versus the male population in 2003 and in 2007. Table 1 will show how women engineers performed.

Table 1: Distribution of Female in 2003 and 2007 Licensure Examination in Engineering

Engineering Profession	No. Of Passers 2003	Female No. % 2003	Males No. % 2003	No. Of Passers 2007	Female No. % 2007	Male No. % 2007
Aeronautical Eng'g	54	2 4%	52 96%	36	3 8 %	33 92 %
Agricultural Eng'g	159	54 51%	105 49%	205	84 41%	121 51%
Chemical Eng'g	415	225 59 %	190 41%	438	245 56%	193 44%
Civil Engineering	3152	770 32%	2382 68%	2256	621 28%	1635 72%
Electronics Eng'g	3007	703 23%	2304 77%	2146	564 26%	1582 74%
Geodetic Engineering	226	57 34%	169 66%	170	48 28%	122 72%
Mechanical Eng'g	1505	55 4%	1450 96%	1658	96 6%	1562 94%
Metallurgical Eng'g	30	11 58%	19 42%	13	6 46%	7 54%
Mining Engineering	12	2 20%	10 80%	20	4 20%	16 80%
Naval Archi & Marine	16	2 4%	54 96%	5	0 0%	5 100%
Electrical Engineering	1557	149 11%	1408 81%	1386	169 12%	1217 88%
Sanitary Engineering	55	11 25%	44 75%	35	14 40%	21 60%

Source: 2003 and 2007 Compilation of Statistics on Performance of schools in Various Licensure Examination, Philippine Professional Regulation Commission (PRC)

From Table 1, it is also interesting to note that women are not so attracted to Naval Architecture and Marine Engineering. In all the engineering fields, female engineers are represented. However, it is still the male engineers dominating most of fields, percentage wise, except in chemical engineering where women outnumber the males.

Female engineers as top managers or middle managers are favoured because of their flexibility in their work place particularly in research and development institutions. Her training in logical and analytical way of thinking helps in better decision-making. This is the qualification that differentiates an engineer with other professions. Additional, advantage of women engineers is their characteristics of being highly qualified, patient, approachable, and ready to learn.

Please note also that in terms of employment as faculty member, generally the male faculty members dominates the female. But for all engineering schools, in chemical engineering it is the reverse. Also in one school, in industrial engineering the female faculty member exceeds the male faculty.

Furthermore, in some of the engineering schools, female engineers were appointed as deans: University of Santo Tomas, University of the Philippines, De la Salle University and San Carlos University. Others are appointed as chair of particular engineering programs. In terms of position higher than deanship, an engineer was appointed as vice president.

In the government service, the highest position of a female engineer with a rank of Cabinet Secretary of the Department (equivalent Ministry) of Science and Technology (DOST) is presently occupied by a chemical engineer. The author has occupied the Cabinet Undersecretary level at the DOST previously. In other government agencies and institution, a number of female engineers occupy the position of director or middle management level. Majority of the staff members in most of the science and technology institutes or research entities are female engineers.

On the other hand, this is also true for non-government organizations (NGO) research institutions where female engineers are employed at the middle management level. Female engineers, who are the owners or part-owners of the company secure higher positions.

In resume, the presence of female engineers in the workplace is presently accepted unlike in the 1050s and maybe to the 1970s. The old notion that a woman's place is the home and that she is excellent only in taking care of the home is now a fallacy. Women engineers can balance their profession with their domestic chores. Extra assistance from domestic helpers and the extended family is fortunately still available in the Philippines.

In conclusion, the contribution of women engineers in all levels of the society, community and work place cannot be discounted. Women engineers contribute to the formulation of policies, rules and regulations that are practical and with a woman's touch.

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