

WHAT DOES ENGINEERING ETHICS INVOLVE?

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Abstract

This paper aims at elucidating and concluding information on engineering ethics, rights of engineers versus employee rights. This theoretical objective was achieved by the bibliographic study of some reference works in the field. The objective of the qualitative research is to identify the engineering students' and master degree students' perceptions regarding professional ethics and the environment that most influence their behavior at work.

Key words: engineering ethics, work ethic, rights of engineers, employee rights, moral obligations and moral rules in engineering

1. Introduction

The word ethics stems from the Greek word *ethos* and refers to customs. Ethics regards the features of morals.[3],[6]. At the outset, ethics represents the pursuit for and comprehension of the decent life, a life with good values. Ethics also strives to find a suitable place for each action and objective and emphasizes what is proper to be accomplished and what is not proper to be accomplished.

We can define ethics as the field of science which sorts out what is decent and indecent and with moral responsibility and moral obligation. In *Professional Ethics and Human Values in Engineering*, Jayakumar mentions some of the commonly established ethical values: integrity, honesty, humanity, responsibility, accountability, confidentiality, discipline, loyalty, collegiality, conscientiousness, competency, diligence, wisdom, courage, temperance, justice, etc.[5],[7],[12],[13].

2. The research objective and the research method

The present paper aims at elucidating and concluding information on engineering ethics, work ethics, rights of engineers, employee rights, moral obligations and moral rules in engineering. This theoretical objective was achieved by the bibliographic study of some reference works in the field.

The objective of the qualitative research is to identify the engineering students' and master degree students' perceptions regarding professional ethics

and the environment that most influence their behavior at work.

The chosen research method is the qualitative research of the exploratory type and involved the interviewing of a small number of students about how they regard professional ethics, the data not being statistically representative of the studied population. The qualitative research is very complex and studies: the motivations, the perceptions that determine the student to act in various ways, ethically, morally deontologically and at the workplace.

The Study hypotheses:

H1: Elements of professional ethics in engineering are applied in collective projects and in the teamwork.

H2: The understanding of right and wrong, good or bad behavior has its origin in each person's concrete experience.

H3: Elements of ethics exist more due to family and the environment and less due to schooling.

The method used for this article was the interview and the investigation technique: the mini-group. The sample was 100 engineering students and master degree students who have completed internships in production firms or who had or still have jobs as engineers.

3. What does Engineering Ethics refer to?

Engineering ethics focuses on [1],[2],[4]:

1. The study of the moral topics and judgements regarding people and societies belonging to the engineering field;

2. The study of correlated concerns referring to the moral principles, figures, guidelines, and interactions of people and companies concerned with technical actions.

Engineering Ethics also highlights the ethical responsibilities of the engineers due to their professional grade. It is a guideline of how engineers should behave in certain circumstances especially in their professional life [2],[3].

4. What does work ethics imply?

The work ethic is a cultural standard that involves personal responsibility for one's own work, includes the belief that work has inherent significance and it frequently refers to people who perform a good work hard and are dedicated to it.[10],[11].

Jayakumar summarizes the following three elements regarding work ethics:

1. Interpersonal skills;
2. Initiative and
3. Being dependable.

One of the most highly appreciated qualities for workers in the contemporary place of work is being dependable. This work ethic hypothesis embraces trustworthiness, dependability and punctuality. If engineers are not reliable, they are considered to be redundant in the company because of the wasted time and funds their conduct exposes.

Employers who are responsible for information must regularly establish their own agenda, commonly work under less surveillance and normally go through adjustments and novelty in their work.[10],[14].

During the years a lot of employers have been requested to point out the most significant abilities and features they try to find when they want to hire new personnel. Among the most important traits they mentioned the following ones: a confident attitude, good communication abilities and the capacity to be trustworthy, prompt and accountable.

5. Rights of Engineers

In addition to the many responsibilities engineers have, they have many rights as well since rights and responsibilities belong together. Jayakumar indicates the most widespread characterization of right: "a right is a valid claim to something and against someone which is recognized by the principles of an enlightened conscience". [3], [11].

Jayakumar also categorizes the theory of rights referring to the following three types: *Human rights*, *Employee rights (Contractual rights, Non-contractual rights)* and *Professional rights*. He goes on categorizing the fundamental **human rights** adopted by the United Nation's International Bill of Human Rights:

1. Right to life.
2. Right to liberty.
3. Right to security of person.
4. Right not to be held in slavery.

5. Right not to be tortured or subjected to inhuman or degrading punishment.

6. Right to recognition before the law.

7. Right to impartial trial and protection from arbitrary arrest.

8. Right to freedom of movement.

9. Right to marriage.

10. Right not to marry without free consent.

11. Right to property ownership.

12. Right to freedom of thought's

13. Right to peaceful assembly and participation in government.

14. Right to social security and work.

15. Right to education.

16. Right to participate in and form trade unions.

17. Right to nondiscrimination.

18. Right to a minimal standard of living.

Consequently, engineers have human rights concerning their way of living and the way they can practice their own activities, personal and professional, without restrictions.

The rights that denote or relate to the position of an employee are called **employee rights** which can be, according to Jayakumar: contractual employee rights and non-contractual employee rights. [2],[6],[7]:

a) Contractual Employee Rights

This type of rights are official rights that occur merely as a result of definite settlements in the employment contact. The contractual employee rights take account of: the right to have a salary and the right to obtain other profits of the institution where an employee works, for example bonuses.

b) Non-contractual employee rights

This type of rights occur although they are not officially acknowledged in the definite contracts or business procedures. The non-contractual employee rights consist of: the right to decide on activities performed outside the institution, the right to confidentiality, the right to lack of sexual harassment and the right to nondiscrimination.

Professional rights are preserved due to the quality of being experts who have distinct moral duties. [9] The professional rights include: the right to make use of one's expert judgment based on his/her integrity, the right to disagree with being part of immoral conducts, the right to notify the customers about risks, the right to state one's expert judgment, the right to impartial appreciation and payment for specialized services.

6. Moral Responsibilities and Moral Procedures in Engineering

The dominant requirement when carrying out engineering and technical results is to offer a precise justification of the accomplished research and an impartial argument of its importance.

A moral responsibility represents the obligation to follow a definite strategy, specifically, to perform or avoid doing specific activities. It might occur from promising something or from starting a certain job. [9],[10]. For instance, as stated by countless engineering codes of ethics, engineers have an ethical right to tackle matters of misconduct outside their companies and, moreover, they have the responsibility to make sure of acting this way when community health and security are at risk.

On the whole, a commitment is positive if one has to make sure of the fact that it is going to be achieved. If the engineer who has this responsibility simply refrains from fulfilling definite things, the commitment is negative.

The responsibility to keep some information private might appear to be a negative commitment, as regularly it would involve simply that one should avoid doing activities of confession.[10] Nonetheless, in specific situations one may well have to take distinctive protection to avoid divulging an employer's private information. In this situation, the obligation involves a positive action and thus would present the features of a positive commitment.

An engineer's responsibility to keep a client's data private is a symbol of the moral rule to keep private the information of one's specific customer or manager. This regulation is part of the codes of ethics of various engineering companies.

7. Classifications of Moral Rights

1. Moral Rights

The theory of *moral right* is one of the most acquainted theories in the current ethical debates, together with the theories of benefits and damages. The bases of moral rights are ethical but, the same right might be an ethical right, a legal right, or an institutional right, all at once, even if one category of right need not be another category, because only one type of explanation might be real for it.

2. Technical Proficiency

Engineers need to be technically proficient and behave themselves expertly because they are requested to undertake challenging assignments which require precise aptitudes and knowledge. When a superior entrusts a project responsibility to an engineer, the superior expects the engineer to fulfil this assignment with high quality in an appropriate time and manner. If this assignment is fulfilled carelessly, or if it is half-finished, the whole project is threatened. [1], [2],[4]. There might be cases when a new engineer does not have so much practical knowledge and he/she is assigned a task for which the engineer is not experienced. In such cases it is recommended that the engineer confess this honestly to the manager because he will observe it anyway. Such liable conduct will be acknowledged and the engineer might be given a tutor for this task or be trained for it. Even though the task is redistributed to

a different engineer, the new engineer is known to have behaved appropriately and helped to civic protection.

8. The conclusions of the qualitative research

Our preliminary premise is that those who study engineering, whether master degree students or just students, did not have any courses dedicated to professional ethics. We assumed that they had acquired the rules of professional and behavioral ethics from experience, without having been taught it.

As we can see in Figure 1 a large percentage of 49% of the respondents admit that their involvement in a team is based on ethical considerations, and another 32% of the respondents consider that the support provided to their colleagues is also good practice related to professional ethics. Thus, our first hypothesis: *Elements of professional ethics in engineering are applied in collective projects and in the teamwork* is confirmed, supporting the fact that collective projects and teamwork are based on ethical considerations.



Fig. 1: What do you see as the foundation of your ethical practice?

Fig. 2 demonstrates that the understanding of right and wrong, good or bad behavior originates in particular from the examples of more experienced engineers and also from the assessment of their own activity. It seems that the experience (from home, school, social environment) is not enough to understand the complexity of ethics in engineering.

Thus, as we can notice in Figure 2, the second hypothesis: *The understanding of right and wrong, good or bad behavior has its origin in each person's concrete experience* is not confirmed.

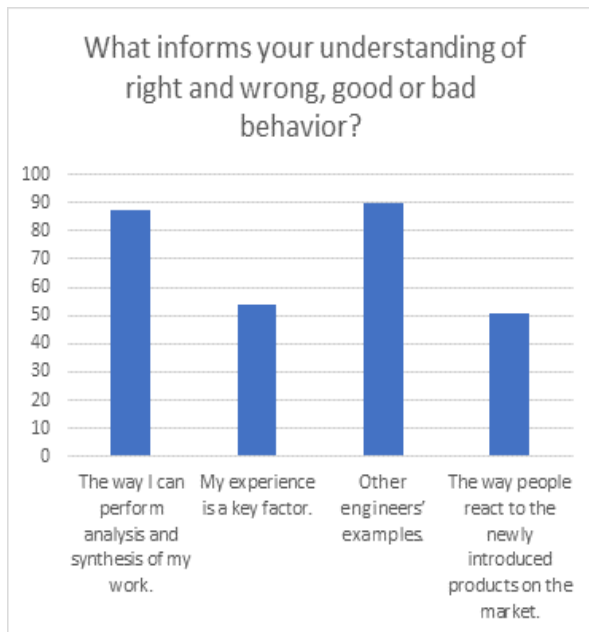


Fig. 2: What informs your understanding of right and wrong, good or bad behavior?

Common sense, the way you behave at the workplace, how you respect the rules, yourself and the others are all ethical elements that have different learning sources. Since we are born, we learn some of these ethical features in the family, in the community, the group of friends, or even his/her religion. Together with the choice of being an engineer, this sphere of information regarding ethics is expanding, and studies, professional practice, the workplace actually influences the way a person relates to work ethic, moral obligations and moral rules in engineering.

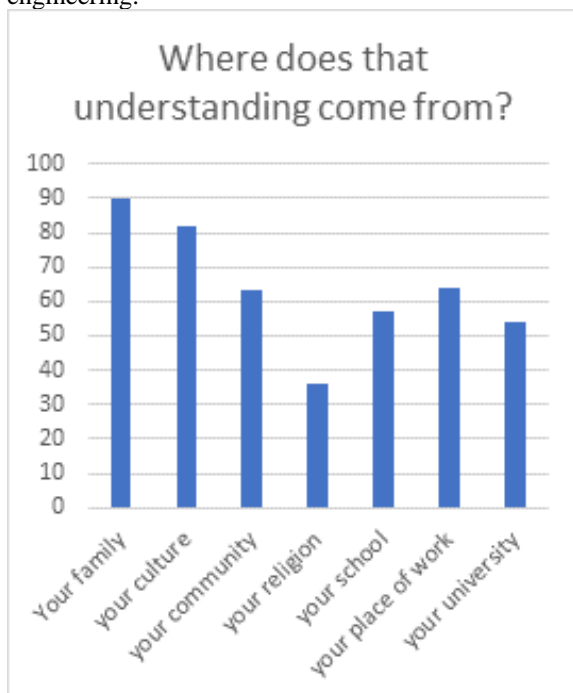


Fig. 3: Where does that understanding come from?

In Figure 3 there are graphic representations of the elements that young engineers or future engineers consider to have influenced them the most in terms of perception of professional ethics. Thus, as we can see, the highest values belong to family, culture, and the community. Even though religion was not considered to be an important factor for the influence of professional ethics, however, the lowest values of factors such as school and university conclude that professional ethics was not one of the subjects taught in these educational institutions. Hence, future engineers rely more on the common sense they have acquired in the family than at school. Thus, the third hypothesis: *Elements of ethics exist more due to family and the environment and less due to schooling* is conformed.

9. Conclusions

Engineering ethics might be regarded as the identification, training and solving of ethical difficulties which can come about in the engineering career. But the theory of engineering ethics is not to be applied only to engineers. It can also be functional for other people who intend to get involved in technical initiatives, for example experts, mechanics, technical critics, production personnel, administrators, sales personnel, doctors, legal representatives, and common members of the community.

Engineers have the right to complaint and disclose such situations that commonly regard severe deficiencies and misconduct, for instance reduced quality or monetary fraud. And if engineers really reveal such situations, then we can say that they are obviously morally authorized to perform such actions. [7]

As can be noticed from the research we carried out, it is necessary for engineers to understand elements such as engineering ethics, work ethics, rights of engineers, employee rights, moral obligations and moral rules in engineering, they should also be familiar with these features during the years spent in the schools and universities they had chosen to be part of and which should play a certain role in their future education.

Technical abilities and knowledge are main requirements in any engineering job together with work ethic and work approaches, which are also necessary for success. People with these features are not so easy to be found, nonetheless it is not unmanageable. And engineers need to cultivate and achieve these values because once they learn about these abilities and exploit them, they are confident to increase their capacity to be effective on their profession. [8]

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