Architecture for Teaching Computer Ethics within an e-learning Environment

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Abstract: - E-learning technologies have extensively been adopted by institutions, such as universities and schools, either as facilitators to traditional teaching methods or as autonomous ones. Teaching material and methods have accordingly been developed for many academic disciplines, especially within the computer science. Since students of computing schools and departments are the most familiar with related technology, they are the most receptive ones to e-learning technology as well. However, not all topics are easy to be implemented within an e-learning environment and taught in online mode. Computer ethics is such a topic which, despite its importance for future professionals in the field, has not benefited from e-learning developments. Although some researchers argue whether computers can assist teaching of such a topic at all, building on some relevant approaches we propose our framework and initial work towards implementing a course on computer ethics within an e-learning environment.

Key-Words: - computer ethics, e-learning

1 Introduction and motivation

Advances in technology tend to be followed by corresponding ethical issues, as it is evident from relevant historical facts. Information technology is nowadays the most prominent technological development that affects almost every aspect of life, and our dependence on information technology increases. As a consequence, emerging ethical issues, that individuals or professionals face, require appropriate skills. As Johnson [1] notes "Technology instruments human action and technology makes it possible for individuals and institutions to behave in ways they couldn't behave without technology."

This situation has resulted in ambiguous zones of behavior, regarding what is authorized and acceptable or unauthorized and illegal, which are not handled by our traditional ethical rules. A great amount of existing literature mentions incidents of unethical behavior, especially within IT industry, by professionals or individuals, varying from unauthorized use of e-mail to malicious behavior. Part of this behavior is due to relative lack of clear definition and monitoring of such ambiguous zones

and the common belief that ethical standards in cyberspace are vague.

The above clearly demonstrate the need to tighten the relationship of IT and ethical behavior especially within professionals in the field [2],[3], which however cannot be the result of a more restricted policy and regulation only. "Law is neither the beginning place nor the ending place when it comes to filling the policy vacuums and addressing ethical issues." [1]. Specific training at course level is necessary as well for ethical decision making improvement, whenever it comes to ethical dilemmas, either as a horizontal training seminar to both IT future professional an non ones, or as a standalone semester course.

In this paper we demonstrate our methodology and architecture for teaching a computer ethics course within an e-learning environment. It is an initial work towards an autonomous module, which is oriented towards improving students' ethical decision making. Despite the debate on whether such a topic can be even taught and consequently influence students towards a more ethical behavior [4], we argue that such training can create the necessary familiarity with ethical issues and develop

awareness on cases that might include possible ethical issues, overcoming individuals' motivation and perspective towards ethics. In addition, the proposed analysis path helps students handle and analyze such issues, improving thus their critical thinking and ethical decision making.

Following in the paper we present some key points of major ethical theories along with relevant approaches in teaching computer ethics (Section 2). Next (Section 3), we outline our model and architecture of the course and conclude with some discussion and comments on future work (Section 4).

2   Background and relevant work

2.1   Ethical theories concepts

Several ethical theories, from the ancient times to today, have been advanced as to how one should act in order to be aligned with ethical rules. However, every individual has a unique perspective towards ethics, which depends greatly upon relevant culture, environment, and personal development. Below we present a brief overview of major theories towards ethical behavior.

- *The Golden Rule*: This rule derived from ancient philosophers simply suggests that one should treat others the way he or she wants to be treated, as the best choice to the decision maker who faces an ethical dilemma.
- *Utilitarianism*: Utilitarianism is a consequence based theory developed by British philosophers Jeremy Bentham and John Stuart Mill. It states that one should consider only the consequence of the action and the number of people positively affected when making a decision.
- *Pluralism*: Pluralism theory is based on doing one's duty, and thus decisions should be made regardless any consequences but only with the sense of duty to do the right thing.
- Some other theories include *Contractarianism*, which supports an implicit contract between society and government concerning civil and personal rights and responsibilities [5], and the *Josephson Institute Ethical Decision Making Model*, which utilizes the Golden Rule along with concepts from utilitarianism and pluralism [6].

Researchers argue that IT evolution has created completely new ethical problems and thus expanded existing ethical questions [7]. In addition, they define some areas where considerable issues arise from IT evolution, despite the substantial benefits deriving from it [8]. Forester and Morrison [8] define seven such categories:

- Computer Crime and Computer Security
- Software Theft and Intellectual Property Rights
- Computer Hacking and the Creation of Viruses
- Computer and Information Systems Failure
- Invasion of Privacy
- The Social Implications of Artificial Intelligence and Expert Systems
- Workplace Computerization

2.2   Ethical decision making methodologies

Ethical decision making problems are usually extremely complex to be solved by an algorithm providing a valid choice to the decision maker [9]. Several researchers are skeptic about tools that have been developed in order to assist decision making for such problems. To overcome this issue, several heuristics have been proposed as procedures for ethical cases analysis and decision support.

Below we provide a brief overview of some heuristics as analyzed by Maner [9], which could be used to support ethical decision making by providing a series of steps that help individual react to emerging ethical problems.

Worksheet for ethical decision making: [9].

- What is the ethical issue or problem?
- What immediate facts have the most bearing on the ethical decision you must render in this case?
- Who are the claimants in this issue and in what way are you obliged to each of them?
- What do you think each of these claimants would prefer that you do regarding this issue?
- List at least 3 alternative courses of action.
- Are any of your alternatives supported or rejected by ethical guidelines?
- Determine a course of action based on your analysis
- Defend your decision in the form of a letter addressed to your most adamant detractor.

The Joesphson Institute of Ethics lists the following three familiar ethical principles:

- *Golden Rule*: are you treating others as you would want to be treated?
- *Publicity*: would you be comfortable if your reasoning and decision were published?
- *Kid-On-Your-Shoulder*: would you be comfortable if your children were observing you?

Chris MacDonald (1995), states that it is important that people ask and answer this question when consider the nature of some form of action; am I comfortable with this decision? He suggests that these subsidiary questions also need to be asked.

- If I carry out this decision, would I be comfortable telling my family about it? My clergyman? My mentors?
- Would I want children to take my behaviour as an example?
- Is this decision one which is a wise, informed, virtuous person would make?
- Can I live with this decision?

Finally, Morris [10] proposes parallel spaces methodology. He refers to the real and virtual worlds as parallel worlds.

Parallel space methodology:
- identify parties and their interests
- explain the ethical problem
- construct an external and internal analogy
- for each analogy identify the values and outcomes
- devise a staged analogy to highlight contrasts
- select an appropriate course of action

2.3 Similar work

Due to particularity of the topic, we identify several approaches for teaching computer ethics [12], [13]. Except differences in duration, which may vary from short seminars to semester courses [14], [15], courses differ on the overall approach of the subject as well.

Some approaches are more theoretical, based upon presentation of case studies and ethical theories [16], [17] since teaching ethics to students using real life case studies to illustrate the ethical issues is popular [18]. King [14] proposes the outline of such a course concerned with responsibilities of computer scientists and end-users of computers toward society. Robbins, Wallace and Puka [18] have developed a web-based application guided by normative ethical theory and presented users with case-studies.

Other approaches promote active participation of students towards imaginary ethical decision making cases. Coldwell [19], [20] has created a virtual classroom for a course in computer ethics at Deakin University, using FirstClass1, an on-line conferencing package which uses the client-server paradigm but also has a web interface, while recently WebCT technology has been adopted. Mancherjee and Sodan [4] have developed 'Ethos Tool', an application designed to solve practical ethical dilemmas and teach ethics, based primarily on utilitarian theory. The application teaches users to develop a framework with procedural steps to address ethical problems rationally. Goldin, Ashley and Pinkus [21] have developed a Professional Ethics Tutoring Environment or (PETE) that enables students to practice methods of moral reasoning. PETE differs from other applications in that it is augmented by other students' analysis of cases.

3 Proposed model and architecture

Since ethical behavior is strongly affected by personal background (Section 2), which is not possible to be altered within the frame of a computer ethics course, our main objective is to provide a course which primarily targets to improve students' awareness of ethical issues within IT and further develop their ethical decision making skills [22].

In order to maximize students' participation, we utilize e-learning technologies to deploy the course. We mix traditional teaching methods, such as lectures, with virtual team formation and remote collaboration towards ethical decision making in a way to achieve maximum involvement of students [23].

To improve awareness we provide a number of case studies which raise ethical issues along with a brief analysis. In addition, a heuristic is provided as a basis for case analysis and ethical decision making which is executed either individually or cooperatively. Additional heuristics are provided for case analysis and decision making, where teams collaborate to select the appropriate one for each case.

E-learning technology provides substantial benefits for such a course, since it increases active participation, which develops students' critical thinking on ethical problems, reducing thus lecture time only to necessary topics.

3.1 Ethical decision making methodology

Heuristics (Section 2) provide a useful procedure for ethical decision problem handling. We provide the following methodology as an introductory ethical problem decision method as outlined below:

- *Step 1*: Establish who the people involved are and their interests?
- *Step 2*: For each person or groups identified in step 1 describe the ethical problem from their point of view.
- *Step 3*: Contrast the views of the ethical problem by considering each others point of view.

- *Step 4*: Describe the ethical problem in terms of a real life problem that is similar.
- *Step 5*: Construct an open situation where all parties are able to see each others actions.
- *Step 6*: Select one solution and justify the choice.

3.2 Architecture

Based on the above model we demonstrate our architecture for a computer ethics course within an online teaching environment. The following components have been implemented:

- *User levels:* Class home with appropriate levels of entry (e.g. student, instructor, administrator).
- *Collaboration facilities*: Flexible virtual team formation (Fig. 1), group debates about ethical positions, blackboard, role playing with hypothetical scenarios.
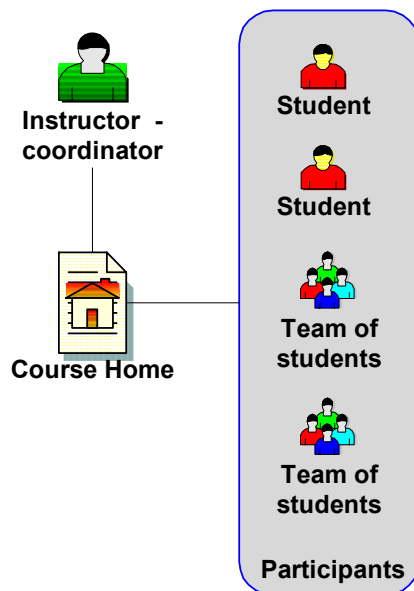

Fig. 1.- Virtual teams

- *Communication facilities:* Communication between instructor and students or teams, blackboard post.
- *Repositories:* Repositories provide all the necessary information and methods for both students and instructor, being thus the core components of such a module (Fig. 2). In more details, the following repositories have been developed:
  - o *Case studies:* contains a number of real case studies which raise ethical issues. Students are working on these cases following instructor's guidance.
  - o *Analyzed cases:* contains some examples of cases which have been

analyzed in order to demonstrate methodology (Section 3.1).
  - o *Ethical theories:* contains analysis of ethical theories and methodologies for ethical decision making.
  - o *Heuristics:* contains a number of heuristics for handling ethical issues. Students may follow different paths to take an ethical decision according to their familiarity with the subject.
- *Interfaces:* Flexible and simple to use interfaces provide easy access to all the repositories and facilities.
- *Assessment facilities:* Computer science students feel more comfortable with objective answers rather than subjective ones. Our target is to motivate them participate without fearing unfair grading. A knowledge base with a number of follow up questions helps students clarify concepts of ethical theories and practices. In addition, instructor evaluates student or team performance using appropriate assessment tools.
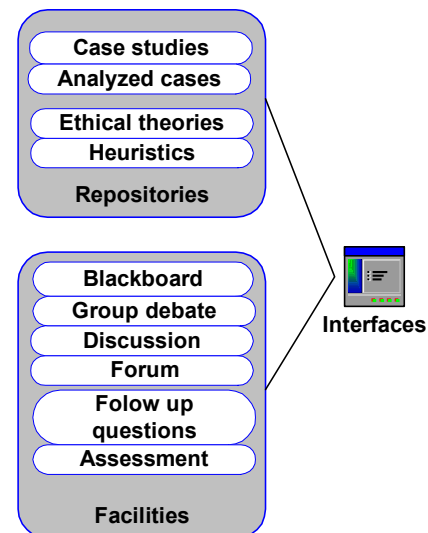

Fig. 2.- Facilities and repositories

4 Conclusion

In the above we presented an outline of our architecture towards teaching computer ethics online. Although many experts are doubtful about this option, from our experience we argue that it is possible to teach computer ethics virtually. However, due to the nature of this discipline, we believe that it must be undertaken in a systematic way in order to maximize student involvement. Moreover, the infrastructure itself must be easy enough to use otherwise the technology will detract

from the content being presented. Our proposal is well fitted within an e-learning platform with minor modifications, benefiting from student familiarity. Our future plans include full deployment of the repositories and interface optimization according to feedback from students.

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