Ethics as Applied to Computer Science Students

Mark Brockhoff

Dr. Gary Schmidt

Computer Information Sciences Department

Washburn University

mark.brockhoff@washburn.edu

gary.schmidt@washburn.edu

Abstract

In recent years a new field of study called *Cyberethics* (the field of study that examines moral, legal, and social issues involving cybertechnology, (4)) has emerged with many moral, social, and philosophical issues that require in-depth investigation. Recent publications such as Tanvani's ***Ethics and Technology*** and Trevino and Nelson's book on ***Managing Business Ethics***, provide fertile grounds for numerous ethical questions that today's technology graduate can and should investigate. This paper provides a presentation of ethics as it would be applied to computer science students working in the technology sector. A thesis of this investigation was the hope that students who are provided with a knowledge of ethics would make the commitment to apply their knowledge of ethics to the respective workplace environment. This paper addressed a study that was conducted during the Fall 2003 semester to determine a baseline of ethical knowledge of computer science students.

Introduction

Ethics can be described as a philosophical approach to morality or a reflection on the consciousness of morality. One's actions are considered moral or immoral, ethical or unethical.

Recognized cultures create a set of basic rational logic rules to live by; these rules create a view according to the culture. Morals are based upon a view of the respective culture about what is right and what is wrong. Ethical systems are a set of moral principles about right and wrong behavior based upon ethical knowledge. If we apply our knowledge of ethics to our behavior or the behavioral norm it is applied ethics. "Applied ethics examines the role of ethics in various aspects of our day-to-day lives" (3).

Cyberethics goes beyond the generalized study of applied ethics in fact; it is another field of study. The question of how technology should be developed and used is becoming and increasing issue (4). Cyberethics, is defined as:
"..[T]he studies of moral, legal, and social issues involving cybertechnology….the impact of cybertechnology on our social, legal, and moral system[s]…evaluating social policies and laws that have been framed in response to issues generated by its development and use." This means that as new technologies are developed we can not fully see the impact on any one environment without first using the technology (4).

Cyberethics or ethical studies of technology defined broadly includes but is not limited to any technology that uses a microprocessor. New technologies are developed every day with the prospect of making the world better. It is also, however, true that those new technologies could be used for the opposite reason; chaos!

Today, we can see unethical and immoral practices involving technology occurring more frequently than in the past because of the expansion of technology in the business and home consumer environment. Consumers or end users are either aware or unaware of their immoral or unethical practices. Those consumers or end users that are aware of their unethical or immoral practice do it solely on the basis or belief of advancement and thrill. Consumers or end users that are unaware of their unethical or immoral behavior need to be educated about what is appropriate use of technology. Behavior of this nature is exactly why laws, regulations, monitoring, and education are needed when using or developing technology.

The intent of this article is to provide the reader with a feel of what ethical standards are for computer scientists and users of technology and how to enact on them in situations that require 'what is right.' Successfully meeting most ethical challenges requires thoughtfulness or the basic guideline that one should be 'good natured'. Both proper procedure and 'good natured' are guidelines and moral values that an employee or person hopefully attained during their childhood and educational years. Of course, re-educating employees or persons about ethics and morals is an option. Social interactions and peers can have a great deal of influence on morals and ethics, thus, re-educating people is possible (2).

Background

Computer science has been around for the last 50 years and is playing a larger role in our lives and attracting more attention with each passing year. Technologies will continue to expedite productivity and facilitate research towards a greater goal. However with each new technology concerns become greater for safety and the impact that those technologies will have on their respective environments. Computer science students often limit their scope of the computer science field to the contents of the courses offered at universities or colleges. Many students simply do not see the big picture and the responsibilities involved in the field of computer science. Of course, the scenarios that one might enact during a new technology's emergence are almost limitless, with both intended and unintended results. Examples of this are not hard to find; we simply need to look towards the Internet or classic unethical practices of businesses. I present here two examples of applied cyberethics that computer science students should consider. These certainly are not the only applications a computer science student should consider; in fact, every application of cyberethics is important for proper management of conduct and behavioral norms.

Medical Applications 1.1

A prime example that computer scientists need be aware of are medical applications of technology. The very lives of patients often depend on the technology diagnosing and treating their illness. In this context ethics and morality are no longer dealing with components and circuitry; rather, they are dealing with a human life.

An Oath for Computer Scientists?

There are those who believe that computer scientists should have an equivalent to the Hippocratic Oath, to impart a sense of serving the user… As a physician it would be wrong to choose furthering your agenda of future medicine at the expense of a patient. "'And yet computer science thinks it's perfectly fine to further its agenda of trying to make computers autonomous, at the expense of everyday users"' (1).

Further reading from this particular article reveals that some believe that computer scientists should be required to take a similar version of the Hippocratic Oath that chemists and medical doctors are required to practice under.

An oath may be required to take before developing such technological applications, looking similar to this, "I pledge to investigate and take into account the social and environmental consequences of any job opportunity I consider" (1).

A "first do no harm" policy should be well implemented into ones development or practice. Further examples reveal that patients are the primary concern of those that work in the co-existence of health care and the IT industry.

"..[Computer Scientists who] maintain and sell healthcare computing systems and components have certain obligations that parallel those of systems users, including placing patient care as a primary concern. Although this principle is easy to suggest and

generally to defend it invites subtle and sometimes overt resistance from people who hold profit or fame as primary motivators… Computer scientists should be cognizant that they are designing systems and writing programs for healthcare, not business or e-commerce. As such people's lives often depend on computer equipment or programs (particularly in ICU settings). Placing patients first can be in direct conflict with the business model of generating profits, but not placing patient's needs before profits can result in serious injury even death" (1).

World Wide Web Examples 1.2

Recently, cyber chat rooms have attracted media frenzy over crimes committed on the web due to their unsecured state. Chat rooms often contain easily accessible user information such as home address and phone number. Considering that free chat rooms are often user anonymous, many users pose as someone they are not. Microsoft has recently closed down its foreign MSN chat rooms, claiming that anonymous chat rooms are a "...haven for peddlers or junk e-mail and sex predators" (6). Pedophiles are a major concern in this environment, and children's safety should be a priority with all chat rooms. Microsoft evidently feels the same way, in that they will prevent pedophiles from ever contacting children through their free services. Microsoft will introduce unsupervised chat rooms through subscription services (6). Microsoft feels that subscription services, which require a person to provide his or her true identity, decrease the risk of immoral or unethical conduct within the chat room due to the perceived risk of exposure. Cyberethics can certainly be applied here, but there are critics of Microsoft's move on the proper procedure to police chat rooms. Computer scientists and students who are planning to pursue computer science careers must also be aware of their responsibility to develop with care while simultaneously using the guidelines of cyberethics.

Computer science students' knowledge of ethics or moral principles should be questioned when applied to a situation or scenario. To establish a baseline of that knowledge, concerning this study, an enactment or questionnaire of any one or multiple scenarios is needed.

Research Method

To identify a baseline of ethics knowledge of computer science students a survey was constructed. Forty upper division computer science students at a university in Kansas participated in a voluntary questionnaire to evaluate their ethics knowledge and the application of their ethics reasoning to real life situations. One questionnaire was thrown out due to incomplete status. The questions were as follows:

A.) If you were pressed for time do you copy programming code from other students? (Yes/No)

B.) Do you agree that students still learn a programming language when students copy code from other students? (Yes/No)

C.) If you were to copy code from another student would you spend the time to understand the code or simply copy it to finish the project?

1.) I don't study it; I just want to finish the project.

2.) I look it over to understand how the programming language works.

3.) I don't study it I just change the variable names to make it look different.

D.) Answer the following with the best answer below:

You receive an offer from a software company to develop a portion of a large project. You sign a contract for the project stating that are only the author but not the owner of the code. What does this means to you?

1. Since I'm the author I can use this in my future projects.

2. I know that since I'm the author I am free to help other software companies using the same code schema.

3. I know that I'm not the owner and can't use the code anywhere else.

4. I'm not sure what owner and author mean when developing programs.

Results

The results are as follows using a stated confidence interval of 90%:

Question A asks whether students would copy programming code from other students if they were pressed for time (Yes/No). We can say that almost 13% of the students will copy code from other students. This means that over 10% of the students in this sample population would copy code from other students when pressed for time.

Question B asks students if they can learn a programming language if they were to copy code (Yes/No). 64% of the students would not learn a programming language when copying code. This result would establish that nearly 2/3 of the students in this sample population if they were to copy code would not learn the programming language in question.

Question C asks students in this sample population to further explain their reasoning for copying code. Almost all of the students in this sample population would look over the code, when copying from other students, to understand it. The remaining population stated that they would only change variables. This means that a small subset of this sample population would only change variables without understanding the code properties.

Question D requires students to interpret a fictional situation referencing a contract and ownership or authoring of a computer program. 64% of the students in this sample population would know that they are the author of the code and not the owner. In comparison, we can say that 36% of the students do not understand the meaning of ownership and authoring of programs.

The table below summarizes the results from this study:

Table A: Question Results

Question A Results 39 results		Question B Results 38 results		Question C Results 38 results			Question D Results 39 results			
Yes	No	Yes	No	1	2	3	1	2	3	4
13%	87%	37%	63%	0.00%	95%	5%	0.00%	0.00%	64%	36%
Interval .04-.21	Interval .78-.95	Interval .239-.497	Interval .502-.760	Interval 0-0	Interval .887-1.0	Interval -.007-.112	Interval 0.0	Interval 0-0	Interval .514-.767	Interval .232-.485

Limitations of the study

Several limitations were encountered on this study. Due to a smaller enrollment of upper division CIS courses the available sample size for this study was smaller than expected. The sample size was limited to 39 students. Fair questions in a study often provide better

results than unfair. Some questions may have posed as being unfair. This may have influenced results.

Discussion and Conclusion

Based on the sample size from this university I can theorize that if the exact same questionnaire was given to a similar size population at a similar university. The resulting data would be 90% as accurate as this study. Per the results of this study the data gives an estimate and baseline as to the ethical knowledge of the sample population. We can see that the students in this sample population have a basic knowledge of ethics and of what is right or wrong. In fact most upper division students will have a basic understanding of what is right and wrong.

Assessing the impact that computer science has on organizations and environments for this particular study is seen at the university level. Per this study the upper division computer science students have enough ethical knowledge to understand that the use and development of technology makes an impact at the university. Students are aware that the technology they use and development has the possibility of changing lives and lifestyles. Students are also aware that how they conduct themselves with respect to technology gives them rights for its development and use.

Legal issues are becoming an increasing cluster of current events concerning technologies. Disputes between copyright infringement, trademark infringement, intellectual property suits, unfair business practices, contract disputes, and general patent suits all varying in detail and complexity, have become more common among large technology corporations. Computer science students need to be aware of technology laws as well as contract agreements pertaining to the use and development of technologies. CIS students and professions alike must both at times make a morality check for unfair or unethical conduct relating to a technologies development and use. Developing a technology for abortions, cloning, and certain scientific research often meet moral, religious, and the general public census' scrutiny. There is also the issue at hand whether the development and use of the prior is in effect legal at all.

The main point as emphasized was simply to make the reader aware of what a computer science student's responsibilities truly are. Responsibilities go beyond what a student will earn a degree in or what their yearly salary will be. Ethics, whether it is business ethics or computer ethics, as they overlap, can not simply be made autonomous to any one who uses them. In society we have much to debate on the overlap of ethics, social systems, and law. Just as the expansion and use of technology increases so too should ethics be used to guide and monitor that expansion.

References

1. A Pledge for Scientists (March 4, 2001) *An Oath for Computer Scientists,* Retrieved October 12, 2003 from http://www.journeyofhearts.org/jofh/jofh_old/minf_528/science.htm

2. Nelson, Katherine, A., Trevino, Linda, K. (2004) *Managing Business Ethics* (pp: 7, 10, 11). New Jersey: Leyh Publishing LLC

3. Nancy Kaul, Woner, Glenn, Reeder, Girard & Riordan, P.A.

4. Tavani, T. Herman (2004) *Ethics & Technology* (pp: 2) New Jersey: John Wiley and Sons, Inc

5. The Research Center on Computing & Society (2003) *What is Computer Ethics?*,* Retrieved February 12, 2004 from http://www.southernct.edu/organizations/rccs/text-only/resources_t/teaching_t/teaching_mono_t/moor/moor_definition.html

6. Wired News (September 23, 2003) *Microsoft to Shut down Chat Rooms*, Retrieved October 16, 2003 from http://www.wired.com/news/culture/0,1284,60567,00.html