

Colorado State University



Senior Design Program

Engineering Ethics

Study and Writing Assignment

Due: Friday, 2/25/2021 at midnight

Delivery: One pdf document per project should be uploaded to Canvas

Lecture day: Wednesday, 3/3, 12:00-1:30 **Lecture schedule:**

- 12:00-12:30 each team should prepare a 3-minute summary of the ethical issues related to their project; just the oral presentation – no need for power point, unless teams would like to show some pictures, graphs, or tables. Six teams will be presenting: two volunteering, two chosen by the presenter before the lecture, and two randomly chosen from the list during the lecture. All teams should be prepared to present; we will not let you know in advance if you will be presenting.
- 12:20-1:30 presentation by Dr. Pinar Omur-Ozbek

Submitted papers will be graded on the scale 1-5, with the criteria below:

5 - The team has shown extensive knowledge of different aspects of ethics and team members have done extensive research in this area. Submitted document is of the exceptional quality, providing discussion on multiple ethical issues related to both prescribed topic and their project.

4 - The team has read recommended documents, but has not shown any work "above and beyond" the listed in directions. Students have submitted a good quality ethical paper discussing different ethical aspects.

3 - Students have done some reading of the ethical literature and submitted a document that discusses just a few ethical aspects related to the assigned topic and their project. Evaluators would like to encourage students to read more about this topic and think "outside the box".

2 - Students have done minimal reading of the ethical literature and submitted a document that barely meets expectations. Evaluators encourage students to do extensive research about ethics in the engineering environment, as modern lifestyle and changes in recent years have required extensive knowledge in this area.

1 - The submitted document does not meet expectations. Evaluators are disappointed that they have not received a better document.

The writing assignment has two parts:

Part one:

Choose one of the topics below and write one-page report/discussion on it.

1. Volkswagen emissions scandal: Volkswagen (VW) was possibly 2015's biggest business ethics story. VW is a well-regarded and a well-established company, however, the company revealed that they had installed cheating software on millions of their vehicles to trick the EPA's emissions testers. Their intention was to make the cars look more environmentally friendly than they were. VW lost about \$20 billion in market capitalization. Their investors were worried about the cost of compensating customers for selling them non-compliant cars. The company also got a hit from the fines from regulators as well as a reputational hit.
2. Boeing 737 Max Scandal: Two of Boeing's new airplanes have crashed and killed 346 people within five months in 2019. Executives on Boeing claimed that the cause of the crashes was a problem with the software and an update would fix it. The main cause of the crashes were claimed to be the placement of the engines, as the engine nacelles were mounted higher and more forward on the planes. This caused a change in the aerodynamics of the planes and affected how the plane reacts during a high angle of attack. To correct this, Boeing had created the Maneuvering Characteristics Augmentation System (MCAS). While the angle-of-attack problem was fixed for most situations, new problems were created for other situations. This fix made it difficult for pilots to control the plane without an override by the MCAS.
3. Toshiba Accounting Scandal: Toshiba admitted that because company employees understated the costs on projects, the company overstated their operating profits by more than \$1 billion over seven years (2008-2014), more than four times its initial estimate. It was revealed that the CEO's were putting pressure on the employees to meet sales targets, which lead to false reporting by those employees. The former CEO, the current vice chairman, and 16 members of the current board of directors resigned.

Questions/activities for students to think about:

1. Research the case you selected to get more details on the issue and learn more about the outcomes of the investigations into those violations. Identify the primary ethical dilemma.
2. Consider and assess the violation in the customer's, engineer/employee/CEO's, and regulator/judge/investigator's perspective(s). Discuss the role they played.
3. Discuss how this ethical violation may be prevented in the future.
4. Discuss how this ethical violation may be corrected in the best way. Include the steps already taken by the various parties involved, add potential alternative actions that could be taken. While doing this, consider the stakeholders.
5. Write about your reflections on this violation.

Part two:

Write one-page document discussing potential ethical issues related to your project; special parts of the design you had to consider in order to comply with some of the existing standards (and which), or similar.

The submitted document should be a three-page document, font size 11-12, Times New Roman, single spacing, justified on left and right side, with 1-inch margins on all four sides.

***First page** should be a cover page with project title **as it appears on our website**, team members and project supervisor, topic you have chosen to discuss, your senior design project summary (taken from your website; you have used this paragraph for other deliverables in the past), and a 75-word statement *Why is This Project Important* (used in previous deliverables).*

***Second and third pages** should contain the ethical discussions. They are your actual document to be submitted; first page is just the cover sheet to introduce your team.*

*One document per team should be uploaded to Canvas (pdf of a file, please). The uploaded three-page document should contain cover sheet and both parts of the assignment. Name of the submitted file should be **[key_word] ethics.pdf***

Part One: Topic #3 Toshiba Accounting Scandal

· The primary ethical dilemma was Toshiba's CEO not directly telling subordinates to lie about the current state of the company, but pressuring them to report favorable results untruthfully. This is because the CEO had two options: either put pressure on its own employees to meet target sales, which would result in profit but also in negative behaviors from its own employees, or don't put pressure on employees, which means the company doesn't meet the target sales and profit doesn't go up. The overall outcome from this event was Toshiba's CEO Hisao Tanaka, resigning in 2015 in the face of this scandal. In addition, investigators also recommended many reforms for the company, many of which were targeted at the workplace culture.

· One of the violations Toshiba made was having its CEO put extreme pressure to meet sales targets. While putting on moderate amounts of pressure towards employees is reasonable and expected from a business leader, the extent of which this was done caused the issue. Severe negative impacts were had on the mental health and overall performance of Toshiba employees. In this case, it even made employees feel threatened, angry, and even perpetuate the unethical behavior. This extreme pressure put on Toshiba employees was what eventually caused ruin; the project costs were understated due to employees simply not caring, and putting in less effort to projects.

· The actual act of employees understating project costs is another violation. They jeopardized the company with their actions, showing egregious disregard towards operating costs. Of course, the reason for their actions is because of the pressure put on them by the CEO. And while this pressure led to the problematic reaction, the employees handled the situation incredibly poorly.

· The final, and possibly the largest violation was the excessive overstatement of operating budget. The total exaggeration was 1 billion dollars; more than four times the initial estimate. It was found by investigators that Toshiba was using irregular accounting techniques in order to achieve certain challenges. This is unethical on the company's end and is more of a lie than anything else. Lying about how much your company profited will lead to legal troubles as shown by Toshiba.

· The way this ethical violation may be prevented in the future is by having the future CEO put less pressure on its employees to meet sales targets; this will lead to the employees to deal with less stress and not have to feel like their job is being threatened that they would have to lie about sales targets. This would entail a workplace culture reform. Putting in place a series of checks and balances between the CEO, board of directors, and the employees themselves would be a massive benefit. While these balances may be easy to achieve in theory, restructuring the existing company in a cost-effective way is a particularly challenging problem which calls for further research.

· The best way this ethical violation can be corrected is by first having a CEO that would rather promote a healthy work environment. Toshiba is known for having a corporate culture that demands obedience to superiors, which is unhealthy. A healthy work environment, would lead to better performances and practices from employees. Furthermore, Toshiba should allow its employees to have an honest voice to their superior. If this was already implemented, then the employees wouldn't have understated the costs of projects. Finally, the company should never use irregular accounting techniques like they did from 2008-2014.

Part Two: Ethics and Standards on RamBots

The first, and potentially the largest, source of potential ethical issues in our project is related to the inclusion of open source materials. When code, assets, or other work is released as explicitly open source, there is typically an expectation of fair use in the open source community. Proper accreditation of project dependencies is a highly important point of consideration when embarking on an open source project. While some creators prefer their open source work to be fully and explicitly branded as a dependency – such as a "made with x" banner on a website which uses an open source web framework – others are less concerned with this. A large example of this can be found on YouTube. When publishing a video to the platform, the creator is allowed to pick from a small list of pre-written licenses. The most commonly used of these licenses is Creative Commons Attribution. This is a modification of the Creative Commons base license, which allows "fair use" of existing material. This includes almost any non-commercial activity. The modification of the license (Creative Commons *Attribution*), however, adds an additional clause: sources must be cited. Where before the work was allowed to be used freely, it now needs proper attribution. This can include a simple citation in a video description, or an explicit mention.

Where this ties into our project is with open source software. Two of the most popular open source licenses are the MIT License, and the GNU Public License (GPL). The first is a rather lax license, allowing for near free and total reign of action with a project. Something licensed with the MIT license can be modified, copied, used in closed or open source projects, and in free or commercial products. The only stipulation is that the license follows the work; if the original project is forked (copied and modified under a different name) then the MIT license with proper author attribution needs to remain. A project fork cannot change the license, and creators who add substantial work to an MIT licensed project must add their credentials to the license. The second license, GPL, is much more strict as to how its projects can be used. First, GPL licensed projects must be open source. This does not mean non-commercial – many of the most influential pieces of software ever written for commercial applications are GPL licensed. Second, and most importantly, every project that uses a GPL licensed project as a dependency, must also be GPL. This means that if you publish a GPL licensed piece of software, and a large company wants to use your work as a dependency, their entire project must be open sourced to allow for this. Violations of this carry steep fines – companies such as Visio which have exhibited egregious GPL violations have been sued for millions of dollars in class action lawsuits. It is in this way that our project needs extreme care with ethics: if we were to incorrectly license our work, or incorrectly use licensed work as dependencies, it is highly unlikely we would be caught. Realistically, we could commit license violations and not be caught. This raises a severe ethical issue, one that we need to take care to avoid.

The other potential software related ethical issue pertains to prebuilt application binaries. In order to use software, it needs to be *built* – this is a process which involves generation of assets, compilation of source code files, and formatting of documentation. The build process of a large project is not always straightforward however. It may take an exceedingly long time (Google Chrome / Chromium can take hours to compile even on a reasonably fast computer), or require additional environment setup on the build machine that takes significant care or additional build-time dependencies. In order to remedy this challenge, many open source projects provide *prebuilt* packages. This means that the project maintainer builds the project themselves, on their own machine, and releases all of the final build files to the public. Finally, here is where the potential ethical issue comes to light: can the developer be trusted? Theoretically, the developer could release a modified version of their project binary with a virus. And while the public may consider any open source project trustworthy, its public builds must be *reproducible*. This is a standard practice proving that the same binary can be produced by anyone. A project with an independently verified, reproducible build garners trust. A violation of this principle can bring up a severe ethical dilemma. All builds for or project must be reproducible, with explicit instructions on the process.