

Myth & Morality: Using Fiction to Inspire Moral Courage in Engineers

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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“Because ‘knowing the good’ is not the same as ‘doing good’”

Debra R. Comer & Michael Schwartz,

Highlighting Moral Courage in the Business Ethics Course

Introduction

Over the past few years, a couple of large software engineering mistakes have made headlines. One of the most notable is the Facebook and Cambridge Analytica scandal (Kos, Dreyfous, Korin, & Amer, 2019). Stories like these, as well as other developments in technology, prompted the first change in the ACM code of ethics since 1992. The 1992 change was as a result of the development of the World Wide Web. (ACM Code of Ethics and Professional Conduct, 2018). The updated code still only contains a small subsection on personal data and the updates may not have any effect on the industry. Codes of ethics have historically been considered the way to establish moral cultural norms in professional communities, especially the different fields of engineering. However, a recent study suggests that the presence of these codes doesn't actually have an effect on moral decision making, implying that knowing what is morally right in a given field of engineering does not mean people will act in that way. This same study suggested that having seen news stories related to a given scenario did make people more likely to choose the morally-correct option. Exposure to news stories is dependent on the person but most newsworthy engineering mistakes are used in some way as case studies in education for engineers. An example of this could be the faulty autopilot software and improper pilot training related to the Boeing 737 MAX that caused to airplane crashes. Professors from universities like University of Virginia, Wake Forest, Duke, Purdue and probably others were quick to jump on the opportunity to talk about this disaster in the classroom (Matthews & Choi, 2019).

If exposure to news has an impact on decisions people make, does this impact extend to all narratives, including fiction? If so, false stories that appear to be true could be used in order to manipulate peoples' moral compasses in order to push a certain agenda that a news organization supports. This is especially dangerous when those people are in the field of engineering and where the responsibility to make ethical decisions is often placed on the individual and not encouraged by the organization. On a less harmful note, if fiction is able to influence thought processes similar to nonfiction, it would be a valuable tool in engineering ethics education. Fictional narratives could be used to educate future engineers on potential problems before they actually become tragedies. I will explore whether fiction does actually hold the power I suggested it might and whether that power can be harnessed for positive influence in the field of software engineering.

Part I: News Stories Define a Problem with Ethical Decisions in Software Engineering

Ethics have always been important in the field of software engineering because of how computers were perceived by those who did not understand them.

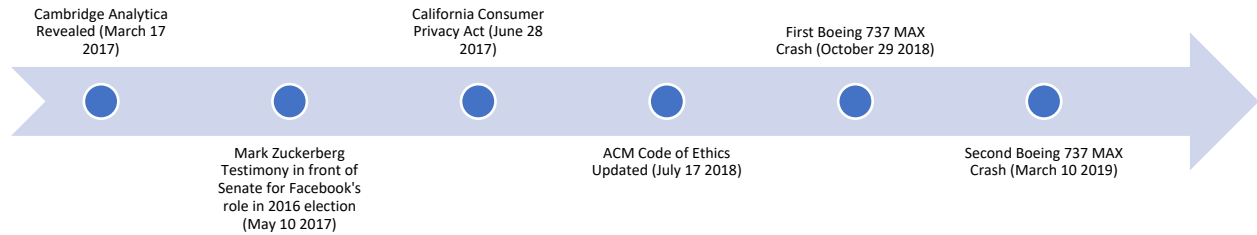
While computers are not the first technology to raise ethical issues, they have been especially fascinating to scholars, science fiction writers, and the public. The origin of this fascination may well be related to computers having been initially perceived and characterized as thinking machines. As such, they were thought to challenge the distinguishing feature of humankind (Johnson p. 392, 2005).

This fear combined with fascination did not fade as the field developed. Although the specific concerns of the public have changed some with the development of technology, the underlying fears are actually very similar. One of the earliest concerns about computers was the amount of

power that they gave to the organizations who possessed them. This ranged from large corporations to the government. An aspect of this power was the record keeping abilities of computers and the implication that the government could keep large amounts of data on everyday citizens. Critics were writing about data privacy as early as 1972 (Johnson, 2005).

It is easy to see the similarities between these concerns and those raised by many people today. Not only do computers continue to be able to store more and more data in less space, the rise of the internet, online shopping, and social networking have created many new avenues for companies and the government to gather data on regular people (Matsakis, 2019). The list of possible ethical dilemmas that software engineers could encounter is not limited to those involving data and privacy; for example, cutting corners on software when human lives are at stake could result in catastrophic consequences. Engineers working on emerging technologies, of which there are a lot of in software, may feel a pressure to misrepresent their technologies as more advanced than they are in order to compete funding in an aggressive market.

Recent events have caused the Association for Computing Machinery to revisit the ways they have previously promoted ethical behavior within their organization and industry. The 2018 revisions to the ACM Code of Ethics were in response to a barrage of headlines involving unethical data collection by some of the largest names in the software industry. Even two years after the revisions, new headlines seem to pop up almost weekly with some sort of new software engineering failure. The Facebook/Cambridge Analytica scandal and Boeing 373 MAX crashes are just a couple of recent examples; both with differing levels of human loss but with equally catastrophic impacts to the reputations of the companies involved. All of this attention has raised some questions about whether codes of ethics are an effective way to encourage moral decision making in the field of software engineering; the evidence suggests not.



Timeline of Software Engineering Scandals mentioned in this paper

The company cultures that allowed these damaging events to occur will not change overnight. This is why it is important to educate engineers on ethics and build their moral courage or “facing other persons while upholding some morally motivated cause and enduring resistance or retaliation that may occur in response to one’s action” (Pianalto, 2012).

There is evidence to believe that ethical decision making can be influenced positively by prior exposure to an ethical dilemma, specifically in the form of a news story.

Does awareness of news stories influence software-related ethical decisions? Since two of the vignettes were based off of recent news stories (Dieselgate and the Waymo dispute), after the questionnaire we provided the opportunity for participants to indicate whether they recognized news stories... We found that students who did not mention the Dieselgate incident were more likely to indicate willingness to create test-evading software. In fact, none of the students who recognized the story indicated they would build the cheat software (McNamara, Smith, & Murphy-Hill p. 732, 2018).

The effectiveness of news stories to shape ethical decision making raises the question as to whether other forms of narrative could be just as influential. The influence of narratives, both fictional and factual, on moral decision making has already been studied outside of the context of

technology. These findings can easily be applied to the specific examples of software engineering scandals. In Gregory Currie's *The Moral Psychology of Fiction*, he describes the way our brains process narratives as similar to that we use to make moral decisions; "the imagination which helps us to see through a moral issue or to make a moral choice is the same mental mechanism deployed when we read or - if we have the right talents and inclinations - create fictional works" (Currie p.250, 1995). This is consistent with the current belief within moral psychology about the emotional nature of moral reasoning. One study attempted to isolate the emotional response by making participants answer ethical dilemmas while performing a task with a heavy cognitive load. There was no statistical difference between their answers and those of a control group who were performing a task with a low cognitive load.

This shows that despite effort put in to complex codes of ethics, where the implications of every word is carefully analyzed, they are not an effective way of shaping the actual heuristics that real people use in everyday life to make decisions that have real world implications.

Part II: Searching for Answers in Moral Psychology

Moral considerations are already part of the foundations on which engineers consider problems. Downey's Problem Definition in Sociotechnical Systems model emphasizes the consideration of stakeholders (Downey 2005). The field of User Experience (UX) Design in software engineering has become increasingly popular; the entire point of this field being to improve the accessibility of software products in a customer-centered way. The point being, engineers have the frameworks to include ethics into their decision making and they have the moral code to know what is right and wrong. The missing piece is in how educators can convince them to act on their moral convictions.

As an engineer myself, it is natural for me to approach problems as if they are engineering problems. This means doing research in order to make an evidence-based decision. I wanted to validate the claims made by Currie about the way human brains process fiction so I looked into the psychology research behind it. Psychology has an appeal to engineers that traditional ethics lacks because of psychology's roots in scientific experimenting. The evidence I found supported Currie's claims about imagination as a way to 'practice' moral choice. It is true that the same parts of the brain, known as the Default Network, are activated when reading fiction as when imagining hypothetical scenarios. In addition to this, reading fiction helps prime those parts of the brain in order to be better at imagining scenarios when they come up. A study on the role of fiction on empathy found that reading literary fiction actually increased empathy when compared to non-fiction and abstract fiction (Tamir, Bricker, Dodell-Feder, & Mitchell, 2015). This is interesting when looked at with the findings of the ACM Code of Ethics study which showed that news stories were able to influence people to be more empathetic. Fiction could hold some untapped power for inspiring ethical decision making in engineers. This is consistent with the claims made by Comer & Schwartz, asserting that "They [fictional stories with morally exemplary protagonists] provide for us a vicarious exposure to situations and thereby supplement our actual experiences" (2017 p.709-710).

The empathy study is valuable because empathy plays an important role in ethical decision making and engineers are often criticized for being too technical minded and not empathetic enough. The study contained both fMRI results and behavioral results. The behavioral results directly relate to ethical decision making, like the study done on the ACM code of ethics.

We found that people who read more fiction were more likely to take intentions into account when judging attempted harm scenarios (i.e. negative intention/neutral outcomes). Specifically,

participants' fiction ART scores were significantly correlated with their ratings on the moral judgment task, such that greater fiction reading was associated with judging actions as less permissible on attempted harm scenarios (Tamir, Bricker, Dodell-Feder, & Mitchell p. 6, 2015)

This increase of empathy could also be applied to engineering ethical dilemmas and probably produce similar results. Questions do arise then about whether or not this would actually have prevented any of the catastrophes described in the news. The study attributed the increase in empathy activation of the default network caused by reading the fiction before they were asked the ethical questions.

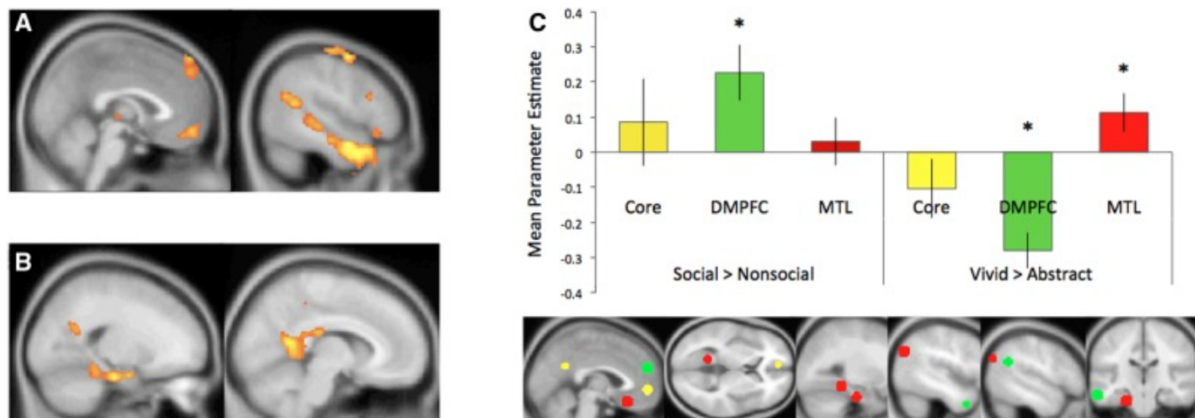


Figure A shows social (left) versus nonsocial (right) passages. Figure B shows vivid (left) versus abstract (right). Figure C shows an ROI analyses. The green bar labeled DMPFC is what is referred to as the “default network” (Tamir, Bricker, Dodell-Feder, & Mitchell p. 7, 2015).

The unfortunate implication of these results is that avid fiction readers are better at ethical decision making but forcibly exposing someone to fiction is not likely to affect their ethical decision making other than right after the fact. This means that in order to see these results in the

workplace among engineers, we would need to inspire those engineers to become avid fiction readers. The results of the case study of MBA students are a little more optimistic. While the evidence provided is very anecdotal, only two classes were taught using this method, the authors assert that “the qualitative data we collected are far richer than the before and after scores of [a previous study]” (Comer & Schwartz p. 718, 2017).

Part III: Evidence for Using Fiction in Engineering Ethics Education

The evidence points to the idea that incorporating fiction into existing engineering ethics education could be a way to inspire newly trained engineers to stand up for what is right and turn any problematic company culture around. For the purposes of this paper, we will assume that the findings related to business ethics also apply to engineering ethics. This isn't really a stretch as both share one important similarity, the need for moral courage in order to do the right thing.

The business ethics study found that

Formal coursework in business ethics has been empirically linked to enhanced ethical awareness and reasoning of undergraduates and more ethical attitudes of MBA students.

However, [no previous study] examines the impact of business ethics education on students' actual conduct (Comer & Schwartz p. 705, 2017).

The MBA ethics class that taught using fiction to build students' moral courage sought to fill this gap between attitudes and behavior. The evidence to the success of the class is anecdotal but, “some students reported without prompting that they had already applied course learnings to act with moral courage at their respective workplaces” (Comer & Schwartz p. 718, 2017). A similar curriculum could be developed for engineers. Some of the same stories could be used, as the building up of moral courage in general would benefit people. In addition to those, some

engineering related stories would need to be found or written. It also would not be absurd to base the stories off of some real-life incidents, an example could be the story of LeMessurier and Citicorp:

William LeMessurier had degrees from both Harvard and MIT, and was no doubt an extremely qualified structural engineer. In the late 1970s, he was tasked with designing the CitiCorp building in New York City. He came up with a relatively innovative design based on the constraints given to him from the property that the building would be located on. Meanwhile, an undergraduate student at Princeton was working on her thesis on the Citicorp building design. She requested the designs and calculations from LeMessurier's firm. When she received them, she discovered that LeMessurier's structural design was insufficient to withstand certain wind loads. She alerted the firm and one of the junior engineers there assured her that the design was more efficient than the calculations let on. The student presented the issues to her advisor when she turned in her thesis, and he also noted the issue she found. However, the student chose to accept the firm's response to her concerns based on their reputation and expertise in structural engineering (Moral Courage: The Case of LeMessurier and Citicorp, 2016).

A narrative version of this story from the point of view of the undergraduate student would be a good example of moral courage for the students to identify with since it is someone in a position very similar to theirs. The story could also be embellished with the emotions that the Princeton student may or may not have been experiencing. Reading about these emotions would help activate the empathy centers in students' brains and better prepare them for the discussions that would follow in class. The class structure could be modelled after the ones in the MBA ethics class which included writing essays reflecting on the readings, class discussions about moral

courage in organizations, and a reflection on a time when the student acted in a way that was contrary to their moral standing because of fear of losing their job or being ridiculed (Comer & Schwartz, 2017).

Conclusion

The best way to move forward following catastrophes such as the Cambridge Analytica Scandal and Boeing 737 MAX crashes is to educate engineers and build their moral courage as part of the engineering curriculum at universities. Introducing fiction to the engineering curriculum could have a positive impact on the way engineers approach moral decisions in the workplace if that fiction contains protagonists who exercise moral courage in situations that engineers can relate to. The company cultures that enabled those scandals are not going to change on their own. People who are part of a group will continue to act in the same way as the group. The way change can be enacted is by newcomers to the group, like the thousands of new engineers who graduate every year and enter the workforce.

A strong foundation of moral courage will prepare engineers to enter the workforce and become contributing members of their companies who are not afraid to stand up for what they believe in. This can best be done through fiction which “provides rich accessible narratives that show students worlds beyond their experience, awaken their imaginations and evoke their emotions” (Comer & Schwartz p.703, 2017). This evocation of emotions can be compared to the activation of the Default Network described in the fiction and empathy study. Fictional narratives could be used to educate future engineers on potential problems before they actually become tragedies and build a sense of responsibility in them to act morally even when they could be faced with criticism from people who hold more power than them.

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