Session 2525

Transformations: Ethics and Design

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Abstract

This paper will focus on an ethics curriculum that has been developed for design projects. The rationale behind it is discussed and some preliminary feedback from students is reviewed. The curriculum for the design projects is distinctive in several fundamental ways. These departures from more traditional views of "engineering ethics" were not come by easily and they have taken many years to develop. 1) We view all design as necessarily ethical and the purpose of ethics curricula is not the addition of ethics but an enhancement of the ethical imagination. 2) While traditional ethics often focus on the individual, decisions in technology are made collectively – including, of course, people who are not engineers. So, our approach includes an emphasis on social ethics, i. e, the social arrangements for making decisions. 3) Technology represents transformations of society and of the environment. We encourage students to understand this and to look both upstream and downstream in the product or service life cycle from the design focal point. 4) Most technology involves transformations that are global in scope and this is embraced by the curriculum. 5) We stress design because most of the important decisions about technology are taken or mirrored there. 6) Finally, design affects everyone but not everyone affects design. We take this as the defining ethical tension in design.

Design

Technology is human behavior that transforms society and transforms the environment.[1] Design is the cornerstone of technology. Design is how we solve our problems, fulfill our needs, shape our world, change the future, and create new problems and new opportunities for present and ensuing generations of all species. It is quintessentially an ethical process. We always "design for,"[2] such as designing for society, the environment, assembly, disassembly, manufacturability, profit, jobs, consumer satisfaction, national security, and so on. From extraction to disposal in the life cycle of a product, the design process is where we make, or reflects where others make, the most important decisions; the decisions that determine most of the final product cost,[3] and the decisions that determine most of the ethical costs and benefits and to whom they accrue. It pays to do design well, but design is much bigger than our pursuit of profit, protection, or pleasure. It is revolutionary behavior that has become routinized and institutionalized. Whether in the Olympics, in the laboratory, or on the operating table, we can no longer even decide where human nature ends and technology begins. Every generation lives in a very new world with radically fewer natural species and many new technological species. Few, if any, areas of ethics are more important than design.

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Ethics

Most approaches to ethics focus on individual behavior.[4] However, most technology is produced through a series of decisions that are made collectively. While recognizing the importance of individual behavior, we will stress the transformative and collective nature of technology and focus as much on what makes a technology "good" as much as we do on what makes an engineer "good." We will consider far more than just the engineer in the product design and development process. All those who help to shape the decision-making are part of the ethics of design. Finally, we view design as essentially an ethical process already, and the curriculum is not intended to add ethics to that which is only technical. For example, the role of the market and profit is an ethical system and not its antithesis. To assume otherwise is to close down debate, and to do so on false grounds. This curriculum is intended to expand the ethical imagination, to understand and to develop alternative ethical perspectives and the tradeoffs among them. The curriculum should help students look upstream and downstream in the transformations of a product life cycle. It should help raise the cognizance of decision-makers with respect to the stakeholders involved: who is driving the production of this product or service and why.

Moral Imagination

This term and concept can now be found in many of the recent books on ethics, particularly professional ethics. In fact, one of the books is titled *Moral Imagination*[5]. This book defines moral imagination as "an ability to imaginatively discern various possibilities for acting in a given situation and to envision the potential help and harm that are likely to result from a given action."[5] If we examine this definition it involves at least two skills, one being able to imagine many possibilities and their consequences, let's say a creative element, and the other being able to morally evaluate the possibilities, a more rational element (but not purely rational). The parallel with the engineering design process is obvious, but rather than being limited to engineering, moral imagination is called for by everyone (including especially engineers and other professionals) in any situation that is not black and white. It is quite possible that if we become more proficient at it, we would realize, by examining choices with this additional lens, we would have less black and white choices. Many of our problems with technology can be described as the revenge of unintended consequences. Decisions that appeared B&W ended up having serious moral consequences. With better moral imagination, we hope that many unintended consequences can be imagined and considered in the decision making process.

The process of being morally imaginative has been described:[6]

1. Disengaging from and becoming aware of one's situation, understanding the mental model or script dominating that situation, and envisioning possible moral conflicts or dilemmas that might arise in that context or as outcomes of the dominating scheme.
2. The ability to imagine new possibilities. These possibilities include those that are not context-dependent and that might involve another mental model.
3. Evaluating from a moral point of view both the original context and its dominating mental models, and the new possibilities one has envisioned.

Disengaging, the first step in this process, is crucial in opening up a larger realm of possibilities for action, and for more thoroughly accounting for the moral implications of an action. For example, Interface, a major carpet manufacturer, was designing a new facility in Shanghai, and one of the processes required a piping loop. Conventional design recommended a certain piping size and requisite pump of 95 hp [7]. But by recognizing the assumptions in that conventional design process, and by considering the impact of the conventional design on energy use and resultant resource use and pollution production, Interface engineer Jan Schilman redesigned the piping system to use only 7 hp, a 92% reduction. This was achieved in two ways, by using larger diameter pipes and by reducing the pipe length and number of turns. It turned out that conventional design wisdom results in relatively small diameter pipes and large horsepower pumps, and does not consider the placement of components to allow for short, straight runs. That wisdom is based on keeping first costs low and to some extent tradition. *It is also based on effectively ignoring the resource and environmental consequences*. Switching to large pipes allows the pumps to be smaller power and size, thereby reducing their cost and offsetting the higher cost of the piping. Furthermore, the large pipe system uses drastically less operating energy, reducing resource use and the resultant pollution. By thinking outside the box and considering the moral implications of energy inefficiency, Mr. Schilman designed a system that did not cost more to purchase, saves enormously on energy cost, and reduces resource use and pollution production. And the job of moving the fluid from point to point is achieved.

In this example, the alternative is an all-around winning situation, making it a straightforward decision and not really requiring much evaluation as in step three of the process described earlier. One can imagine a similar situation where the more efficient alternative costs more and thus requires a look at the economics such as return-on-investment or payback period, and weighing this with the benefit to the environment and society. One could also take this example and point out other angles that aren't considered in conventional thinking that maybe should be. For example, the larger diameter, more efficient piping system may use more copper or steel, so one may be additionally comparing increased use of one resource with decreased use of another. Maybe the larger diameter piping is only available from a distant source, increasing transportation energy use, truck travel, and decreasing the benefit to the local economy. And so on.

As Gorman *et al* acknowledge:[6] "Developing this process is, at best, difficult, …. But not to do so, …, risks moral and technological bankruptcy, threatens ecological sustainability in some cases, and prevents engineers from exercising their talents in ways that will benefit all of us." This enlarged role of engineers is recognized as an evolution from the historical occupation of providing employers with competent technical advice "into a profession that serves the community in a socially and environmentally responsible manner."[8]

Individual Ethics

Most traditional views of ethics in engineering focus on content and method as applied to individual behavior.[4] Content usually includes values such as integrity, honesty, competence, safety, and social and environmental responsibility. It is supported by case studies that are typically about failures and conflicts of interest. In philosophy, methodological distinctions are

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made between ethics that stress outcomes (consequentialism) and ethics that stress right action based on principles or rules (deontologism). This sets the familiar stage for the means-ends debates concerning whether a dubious means that achieves a desirable outcome is justifiable. A third ethics approach, less often studied, is more holistic and focuses on the idea of a noble (virtuous) person (virtue ethics).

Given that individual ethics concerns the behavior of individuals, our use of it in the curriculum focuses directly on the behavior of the students. And in the spirit of active learning, we let them figure it out. They develop the "norms of engagement" for their team and they assess each others respect for, and compliance with, these norms. This way they have ownership, the rules have legitimacy, and their teammates will be policing them. We intend to extend this approach to the management of the project itself by allowing the students to develop project management structure and processes with ethics very much on the table.

Social Ethics

Social ethics focus on the social arrangements that are made for making the decisions about technology rather than on either the individual or the decision itself. Different arrangements embody different ethics and also will lead to different types of decisions. In the abortion debate, for example, while both sides talk a lot about outcomes, the right-to-life proponents are taking a deontological position. The pro-choice proponents are taking a social ethics position that wants the pregnant woman to decide rather than legislatures or churches. An example in technology would be to study a project management structure to make sure the right processes are in place, say, for ensuring safety through checking the data and analyses or for ensuring the inclusiveness of the process with respect to the stakeholders. Project management is an extremely important area for ethics and technology, but it is not often taught in engineering schools. Significantly, most of the engineering failures that are featured as case studies in engineering ethics texts reduce much better to failures in project management (social ethics) than they do to individual failures. Nevertheless, social ethics is widely practiced in society even if it is rarely included in ethical discussions of technology. An excellent exception is Fielder's study of the DC-10.

In our curriculum, we try and build in the excluded stakeholders through a reading for the social transformations involved, and a 10-step introductory approach to ecodesign that has some elements of life cycle assessment.

The Curriculum

As currently practiced, the curriculum has five assignments. The "action" requirements are underlined and occur once or twice for each assignment.

Assignment #1. The method of tracing the uses of energy and resources of a product from "cradle to grave" is called Life Cycle Assessment. An introductory guide for doing this may be found at http://www.pre.nl, although there are many other similar sources. This is the site of a consultant group in the Netherlands. It is rich in links on green design and Life Cycle Assessment. It is also small and easy to navigate. After reading the LCA section go to the

"Ecodesign / Ecodesign Tools" section and use that 10-point guide to assess the product on which you are working. Add a point-of –view that would challenge the restrictions imposed by this "sustainable technology" approach.

Assignment #2. Just as the physical resources and process take place in a global network of related events, so, too, are people all over the world involved through their jobs, their changing natural environment, their consumer patterns, their communities, their businesses, their industries and their governments.

Read an assignment from *STUFF: the Secret Lives of Everyday Things*, by John C. Ryan and Alan Thein Durning and published by the Northwest Environment watch in 1997. The value of these short essays that "backlink" a product to its countries of origin is to illustrate the nature of the global economy. Our actions in the design process are an integral part of a global web of social and environmental processes and these essays capture that reality with great efficiency. The information sources that were used for the essay will also be provided.

A note about the short essays in *STUFF*. They are not literal stories but rather they have been constructed from real data about energy, materials, and products. Nevertheless, they illustrate the types of things that are happening in the global economy quite well. And it is normal to be a bit shaken up by these short essays. They reveal far more than we are comfortable in knowing. However, they are used here to reveal the nature of technology in the global economy. They are not used to incur feelings of guilt or even to study the ecosystem. Design is a key point in the transformative processes of technology, but it, too, is formed by many factors and it has limited, if real, freedoms of its own. None of us alone are responsible for the global economy, but ethics must begin with awareness. There may or may not be things you can do to, but unless you understand fully what design means you cannot begin to expand your ethical imagination or have a chance to do anything to improve the world. And bringing creativity to the design process by searching for the widest array of alternatives can be a result of such an expanded imagination and a way to find a better design in all senses of the word. It is completely wrong to believe there are just two possible designs: a morally good design that is unprofitable, and a profitable design that is immoral.

Write a short statement about the social transformations you think are involved in with the product that you are designing. Include contrasting statements to *Stuff* that discuss the positive benefits of the product such as jobs, profits and the use values.

Assignment #3. Write suggestions that would improve the design of your product or service when considering the social and environmental transformations that are involved. You may include these proposals in the design that you propose if you consider that it would be feasible.

Assignment #4. List the stakeholders for the product you are designing. The more that you can think of, the better your ethical imagination is. Note which ones are represented and which are not. Suggest ways in which more stakeholders might be included and why, and how that might change the design outcomes.

Assignment #5. Individual ethics are also important. As one way to develop these, meet as a team and establish interpersonal expectations for each other. Codify these group norms early in the project and turn them in to your instructor. At the end of the project, grade yourself and each other on how well you adhered to these norms and turn these assessments in, also. Significant deviations from these norms might lead to the instructor adjusting an individual's grade from the group grade, either up or down.

The Reactions of the Students

The curriculum is new and we are just beginning our assessments of it. In the Fall semester, the students were asked to respond to a short questionnaire with a mix of positive and negative statements in a Likert Scale about the essay they read from *STUFF: the Secret Lives of Everyday Things.*[10] In three sections they read the Coffee article [actually they read the WorldWatch Magazine version of it[11]]. In the honors section, they read the article on the T-shirt.

The student responses, collected anonymously, had section response rates of 65-85% and a total of 91 responses. A clear majority liked the article, even more found it interesting and disagreed that reading it was a waste of time. While there were negative reactions, they were not widespread. They were split on whether or not the article was misleading - mostly between disagree and unsure. They were also split on whether the article was disturbing or not. Few felt any guilt about using the product and most thought that consumers did not need to be aware of what it had taken to bring them the product. [The women students were far more likely to state that they felt guilty.] However, there was a clear majority who thought such information should be known to design teams.

Overall the students responded favorably to being exposed to these global realities of technology and found the essays very interesting. They clearly thought that the design process was the place to handle such information rather than through, say, consumer education. They were not asked about the role of socially responsible investing, but perhaps they should be. However, despite a favorable student response and the warning about the impact of the readings, the data still showed some defensiveness and further study will allow a better analysis of this. If we drop the warning, it is likely that more dissent would emerge.

Conclusion

The curriculum we are developing is trying to capture the ethics of technology by focusing on design and what it represents. It is an attempt to make ethics more significant by addressing the real world directly and comprehensively. To date it has been successful in engaging the students.

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