Exposing the Values of Technology through the Liberal Arts

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1 Abstract

The concept of non-neutrality of technology is well established in the philosophy of technology literature. Despite this long history of defending the idea that technology, far from being neutral, actually embodies certain values and biases, engineering students do not readily agree with the concept at face value. They are much more apt to accept the simple cliché that "guns don't kill people; people do." They fall quickly into the misconception that since the tool has no volition nor agency it must be neutral. Why is it important to establish non-neutrality? Failure to recognize non-neutrality leads to tunnel vision and an inability to foresee the broad consequences of a particular technology. If technology is neutral, then the designers, manufacturers, and distributors of technology have little or no responsibility with regard to that technology. There are a number of methods that can be used to persuade students that the technology they design is not neutral, some as simple as using better terminology that more clearly communicates with students. However, one of the most important aspects of convincing students of this concept and more importantly, helping them to see the broad implications, is a strong liberal arts curriculum. An effective liberal arts education helps engineering students to uncover and expose the inherent values that are built into technology as it is developed and deployed. It also helps students identify the multitude of ways those values built into a technology affect our society. Recognizing the feedback between technology and society is essential in evaluating technology effectively from an ethical and moral standpoint.

2 Non-neutrality in the literature

The non-neutrality of technology is well established in the philosophy of technology literature, but this is not so in our society at large. More importantly, it is not well established within the typical engineering student population, perhaps because most students are not familiar with the literature on the subject. Carl Mitcham notes that for many, the question of neutrality turns on the specific meaning of "use". He differentiates between those that stress "use" as the technical function of a technology (which argues for the non-neutrality of technology) and those that stress "use" as the act of using the technology to perform its technical function (which argues for the neutrality of technology).[1] That is, if one looks at the purpose and function of a technology, one sees that it is biased towards certain uses and thus non-neutral; if one considers the purpose only fulfilled in the actual act of use (instrumentalism), then the technology itself seems neutral. In the remainder of this section we will first briefly consider authors that have used instrumentalism to support the notion of neutrality. Second, we will look at authors that directly refute instrumentalism. Third, we will examine two warnings about the dangers of treating technology as mere ends. Fourth, we will turn to authors that consider technology essential to our humanity. Fifth, we will list some darker philosophical approaches to technology. Finally we will survey ASEE papers that address the neutrality of technology.

Philosophers that stress the instrumental nature of technology typically argue that technology itself is neutral – it is the act of using the technology that is value-laden. Joseph Pitt is representative of this viewpoint: "…tools and technical systems are inherently ideologically neutral"[2] and later, "…there is ring of truth to: 'Guns don't kill people, people do'… The tools by themselves do nothing."[3] Similarly, Rammert, building on the work of John Dewey, binds function to use, "Technology has no existence and function outside of its use. It is what I would like to call the *use-relations* that create both the handled object as a tool and the manipulating gesture as technical practice."[4] Some of the earliest philosophers might be considered closet instrumentalists, as they saw technology as merely the fabric on which human actions were interweaved: "The traditional view has been that social institutions (family, religion, economy, state) tend toward a certain independence in ways that call for an attentive effort to incorporate and subordinate them to any particular vision of justice or the good…. In such works [Plato, Aristotle], however, *techne* remains in the background; it seems to be accepted as relatively pliable, readily following the goals embodied in other social institutions."[5]

Many scholars have argued effectively against the neutrality of technology – we will consider here four that directly address the instrumental view. Allchin, in answer to Pitt, claims "it is disingenuous nowadays to claim [that technology is neutral]…the very artifacts bias who can and cannot use them."[6] William F. Ogburn, moves us from instrumentalism towards non-neutrality by relating function and the act of using. "The significance of technology lies in what it does…It is the function of the structure that gives it importance, and the function of the products of technology is use by human beings. Technology is therefore essentially social."[7] Ibo van de Poel notes the prevalence of the "means" viewpoint, "the idea that technology is a means to an end is still a popular vision, both among engineers and non-engineers. This so-called instrumental vision of technology implies that the choice of technological means is a neutral affair, because it is determined by the goals that have been formulated for a technology."[8] The paper goes on to enumerate three reasons the instrumental view is unsatisfactory: 1) formulation of goals and choice of technological means are not independent, 2) choice of means for a given end is not neutral, 3) technologies realize more than their intended goal. Borgmann also considers the "means" viewpoint and claims "...it is an equivocation to speak indifferently of tools in a modern and in a pretechnological setting. A means in a traditional culture is never mere but always and inextricably woven into a context of ends." [9]

Many authors warn of the dangers of treating technology as mere means. Schuurman notes the consequences of ignoring the values intrinsic to technology: "the view that technology is neutral precludes acknowledgement of human responsibility within technology itself."[10] In Monsma we find an argument that even if one grants that technology is mere means towards some end, that by itself does not justify the claim of neutrality: "…technology is value-laden, the product of the inevitable valuing activities of human beings. Clearly, the non-neutrality and the value-ladenness of technology are two sides of the same coin."[11] Assuming that means are neutral (an instrumentalist view) could thus be viewed as a twist on the old error of letting the end justify the means.

Mitcham ties non-neutrality to a view of technology as the implementation of human will: "Human action is ultimately not determined by reason. There is something more fundamental, more basic, more real – namely the will. This is witnessed by the fact of incontinence; knowing what is good on a rational level, human beings nevertheless often do something else. The challenge of such a phenomenon is heightened by the manifestation of technology as volition."[12] Don Ihde makes the case that technology has both an amplifying and corresponding reducing effect: "This non-neutral, transformative power of humans enhanced by technologies is an essential feature of the human-technology relations we shall examine."[13]

Two philosophers that see technology as non-neutral, but in a darker manner, are Ellul and Heidegger. The French philosopher Jacques Ellul argues that technology is not neutral, but more importantly, that we are not in a position to judge technology. Ellul grants technology autonomy – it will do what it will do regardless of what we think.[14] The German philosopher Martin Heidegger points out an ominous danger of believing in the myth of neutrality: "Everywhere we remain unfree and chained to technology, whether we passionately affirm or deny it. But we are delivered over to it in the worst possible way when we regard it as something neutral; for this conception of it, to which today we particularly like to do homage, makes us utterly blind to the essence of technology."[15]

Finally, it is worth noting that while a host of papers have appeared in ASEE publications on the topic of professional ethics, only a small number have focused on the non-neutrality of technology. One of the rare examples is Vanderburg[16], which addresses the problem of a two-stage approach in preventative engineering, where the technological solution of the first stage is considered value-neutral. A few more papers indirectly address neutrality in lamenting the problem of students who view the entire profession of engineering as value-neutral, such as Catalano[17] and Nair[18].

3 Student resistance to non-neutrality

Given that some philosophers (the instrumentalists) argue for the neutrality of technology, it is not surprising that many students do not accept the non-neutrality of technology at face value. However, most students do not come to their position through deep conversance with the philosophical literature. The lack of material in ASEE publications is revealing – if educators are not writing about it, perhaps neither are they teaching about it. The dangers of this omission will be discussed in the next section, but let us first consider why students hold to non-neutrality if it is not on the basis of literature or formal education. Students' rationale for neutrality is likely to be less well thought-out than the arguments for non-neutrality discussed in the previous section, though no less problematic.

First, students are much more apt to accept the old cliché that "guns don't kill people; people do." This slogan misleads us into thinking that it is an either/or proposition – either technology does it, or the user of the technology does it. But it is really both! The use is intimately tied to the available functionality of the object. The use would be impossible or at least much more difficult without the object. The characteristics of the object enable effective action.

Second, students fall quickly into the misconception that since the technology has neither volition nor agency it must be neutral. A tool cannot choose to behave in a good or bad manner, and thus cannot be held morally responsible. But the advocates of the non-neutrality argument do not claim that the tool is morally responsible for the actions of its user – rather, they claim the designer, manufacturer, and distributor bear some responsibility for their product.

Third, with little effort students can name examples of a technology that can be used easily for good or for bad. A gun could be used for hunting deer or for robbing banks; a hammer for pounding nails or people; a computer for accessing facts or porn. Since the same technology can lead to morally opposite actions, they conclude that human actions – and never inhuman objects – are subject to ethical judgments. However, these objects are not featureless. They have specific characteristics that lend themselves to specific usage; features that are in large part the result of an intentional design. While it is nearly always impossible to design technology that is foolproof (because fools are so ingenious, to paraphrase Arthur Bloch), the existence of one flaw does not necessarily condemn a technology as unethical. Rather, the value of the technology is assessed by how likely (due to its specific design) it is to be used in ways that are ethically appropriate. Technology that because of its particular characteristics lends itself to be misused in actions that are unethical should be judged as unethical by design (even if the engineer did not consciously intend those enabling characteristics to be part of the design).

Fourth, it is easier to work with only the explicit design criteria (those that are specified by the customer and various industry standards) than to elicit the numerous design criteria that are important but go unstated by the customer, by the users, or by other stakeholders. Taking the easier, narrower viewpoint prevents students from seeing that technology has many effects beyond the specified function, effects that have assessable value – a concept that tends to support the non-neutrality of technology.

Finally, the standardized nature of technology design may lead students to believe that since the same design method can be used for any end, the means of design itself must be neutral. Mitcham makes this point, in comparison to the Greek idea of *techne*, arguing that modern technology proposes a generic method of production irrespective of the particular product produced and thus the objects have the appearance of neutrality: "modern technology proposes to furnish a *logos* of the activity, a rationalization of the process of production, independent of, if not actually divorced from, any particular conception of *eidos* or form. Is this not precisely why it can so vigorously claim to be neutral, to be dependent in use on whatever human beings want to do with it, on purely extrinsic ends?"[19] The argument based on the impartiality of the design method could be considered a variation on the case discussed above – the fact that a technology can be used for good or bad does not excuse it from any moral consequences.

4 The importance of non-neutrality

Why is the concept of non-neutrality so important? What difference does it make? Believing the myth of neutrality has several negative outcomes. First, failure to recognize non-neutrality leads to tunnel vision and an inability to foresee the broad consequences (intended or not) of a particular technology. As protectors of the public good, the engineer has a responsibility to evaluate the intended consequences of specifications from the customer and the unintended consequences of the particular solution, especially as they affect the public and society at large.

Second, if technology is neutral, then the designers, manufacturers, and distributors of technology have little responsibility or accountability with regard to the technology they produce. Believing technology to be neutral makes one technological solution interchangeable with any other as long as they meet the design specifications.

Third, claiming neutrality is a subtle form of letting the end justify the means. That is, we assume the means (technology) has no other consequences than the end (a solved problem) we are pursuing. Such belief requires ignoring the unintended consequences, i.e., side effects, of the technology, or at least claiming that the benefits of the end outweigh any possible harms caused by the means. An engineer may claim, "I was only doing my job," when accused of providing technology that causes some harm. However, claims of being a mere cog in someone else's bigger wheel are not acceptable excuses in our society. If the end goal and possible uses of a technology go unexamined – even those that are unintended as far as the specifications envision – then the designer is complicit in the unethical acts committed with the technology.

5 Covering non-neutrality in the classroom

There are a number of methods that can be used to persuade students that the technology they design is not neutral. First, however, it is important to note that this idea cannot be assumed nor can it be covered too quickly. Students need time to think about it, struggle with it a bit, and make it their own. One simple technique to address non-neutrality may be using better terminology that more clearly communicates with students. For example, in order to keep students from sliding into the mistake of associating neutrality with lack of volition, terms such as "neutrality" or "value-laden" can be replaced with terms that better reflect the idea that designed form leads to distinctive function, such as "bias" or "inclination". Any technology will surely be biased towards a particular use, because it was designed for that use. For example, it is easier to use a hammer for pounding nails, and a gun for firing bullets than vice-versa. Bias is perhaps a more understandable and acceptable term for students than "value-laden", since it still leaves the ethical agency in the hands of people. However, the bias is not simply that of the designer, but the whole social system (designer, manager, distributor, buyer, user, disposer). A number of authors discussed earlier (Schuurman, Monsma, and Ellul), have suggested the idea of non-neutrality as a kind of bias. Bush reflects on Ellul's discussion of non-neutrality, using the term "valence" to describe this bias, this tendency of technology to be favored in certain situations.[20]

A second method of teaching non-neutrality is to start with a discussion of the responsibility of manufacturers to produce safe products. A product that is designed, manufactured, and sold to a user who is subsequently injured while using the product may make the designer and manufacturer liable, especially if the product was defective in a way known to the producer. For students that balk at the idea of an object having ethical aspects, it may be helpful to note that design, just like use, is a human action that can be judged. The results of the human activity of design are embedded in the technological product. Students are often more likely to admit that the designer can be held responsible for a product which was unsafe due to its design, and this admission can lead to the broader realization that the design is biased in many ways, not just those related to safety.

A third method of teaching non-neutrality is to push students out of the textbook mentality of one right answer to a problem. In the real world, most problems have a multitude of solutions from which we must select a single approach. The choice of means to the one end is not neutral. We must satisfy the design specifications and various standards, but that often leaves many choices even after applying these constraints. The secondary criteria we use to make a selection must be examined, intentional priorities.

A fourth method of teaching non-neutrality is to examine the idea that designers build part of themselves into the design – not just personal characteristics, but societal as well. Kidder quotes a computer engineer on the design of a new computer: "ninety-eight percent of the thrill comes from knowing that the thing you designed works, and works almost the way you expected it would. If that happens, part of *you* is in that machine"[21] This idea of putting your soul into your design is very powerful and can capture the imagination of the students. Stepping just a little further down that road leads us to Mitcham's conclusion, that technology is the implementation of human will, which Talbot echoes: "Of course, every invention, from television to nuclear power, tends to incarnate the will (conscious or unconscious) of its employer. And if that will is less than fully conscious, the invention wields us more than we wield it."[22] The unintended consequences of a technology may be due in part to the unrecognized biases built into the designer because of the society and culture in which she herself is embedded. Engineers will only see solutions that they are culturally conditioned to recognize. Only rarely is something truly innovative conceived, since this requires thinking beyond the societal horizon of what already is, to what could be.

6 Liberal arts and non-neutrality

The liberal arts help convince students of the concept of non-neutrality and more importantly, also can help them to see the broad implications. An effective liberal arts education helps engineering students uncover and expose the inherent values that are built into technology as it is developed and deployed. Context is essential in recognizing intrinsic value, and contextual disciplines such as philosophy and history can provide the tools to recognize the background environment. Like a fish that doesn't recognize the water until it is taken out of it, we don't recognize our own cultural environment until we visit other times and places and ideas through the liberal arts. Such cultural leverage (often called "divergent thinking") is necessary because we often do not recognize our own bad habits until we see them through someone else's eyes. (This is why videotaping oneself while speaking is a valuable tool for improving a speech). Study of the liberal arts, especially if it involves interdisciplinary work, helps students to see the interconnections between various academic fields. This leads to an understanding of the interdependence of knowledge and implies the interdependence of technology and society.

The liberal arts curriculum helps students identify not only the inherent values built into technology, but also uncover the multitude of ways those values affect our society. Again, context is essential to see the historical progression and the philosophical difference when a new technology is introduced. We need the liberal arts to help us understand the impact of technology

– its intended consequences based on design specifications, the unintended consequences, and the broader impact that may not be a specific liability concern, but should be a moral concern.

Recognizing the feedback between technology and society is essential in evaluating technology effectively from an ethical and moral standpoint. This entails discerning the intended and unintended consequences of a technology. Use of an expanded design matrix helps make these choices explicit.[23] When choosing between multiple technological solutions to a problem, one is also choosing between multiple intended and unintended consequences. Unfortunately, the current trend of mass production and globalization tends to give a monopoly to one technological choice. Even worse than narrowing choices as discussed earlier, this trend creates the false impression that only one possible technology choice even exists for a particular problem as reflected in a set of specifications. The liberal arts provide the cultural leverage necessary to allow students to distinguish this broad current in our society, identify the misconception of limited choice it propagates, and recognize that there truly are broader choices. Of course these choices must be developed, and doing so may require incentives.

Technology is a cultural activity (an extended discussion of this aspect is found in Monsma[24]) and its product can be evaluated – is it better or worse than other alternatives? Is it beautiful and helpful? In order to make these judgments, to develop "taste" in technology, a full grounding in the liberal arts is required. This must be broader than aesthetics, because the impact of technology is so broad. It must include the full range of liberal arts that help us explore what it means to be fully human.

7 Future work

In reviewing the work of a number of philosophers of technology, Mitcham notes a deficiency that could form an area of further research: "In none of the cases listed [Ellul, Anders, Mumford, McLuhan, Baudrillard, Weaver], however, do the authors provide extended and detailed analysis of the inner structures of artifacts and how such structures give artifacts inherent tendencies toward specific kinds of human engagement and use."[25] An analysis of the relationship between the structure of technological products and the intrinsic characteristics that lend themselves towards particular uses would help us to understand the non-neutrality of technology. Engineers take this relationship for granted (they design the structure to fit the intended use). However, that same inner structure also leads to unintended but inherent tendencies. Identifying such cause and effect relationships has often been the focus of ethics case studies; a broader philosophical exploration is warranted as well.

A second area for further exploration is perhaps an elaboration of the first – the relationship of justice and non-neutrality. If technologies can be biased toward certain uses – uses that have moral weight – then technologies can cause injustice by design. Much has been written on the social impact of technology, particularly where injustices occur. These impacts are often the result of an unintended consequence of the design. However, these unintended consequences may actually be the result of societal biases built into design because they are built into the design process and into the engineers themselves.

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[3] Pitt, p. 99.

[4] Rammert, Werner, "Relations that Constitute Technology and Media that Make a Difference: Toward a Social Pragmatic Theory of Technicization," *Techné: Journal of the Society for Philosophy and Technology*, v4, n3, Spring 1999, pp. 31.

[5] Mitcham, p. 108.

[6] Allchin, Douglas, "Thinking about Technology and the Technology of 'Thinking About'," *Techné: Journal of the Society for Philosophy and Technology*, v5, n1, Fall 1999, p8.

[7] Ogburn, William F., "The Meaning of Technology," in *Technology and Social Change*, ed. Francis R. Allen, Hornell Hart, Delbert C. Miller, William F. Ogburn, and Meyer F. Minkoff, New York: Appleton-Century-Crofts, 1957, p. 9.

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[11] Monsma, Stephen V., ed., *Responsible Technology: A Christian Perspective*, Grand Rapids: William B. Eerdmans Publishing, 1986, p. 31.

[12] Mitcham, pp. 265-266.

[13] Ihde, Don, *Philosophy of Technology: An Introduction*, New York: Paragon House, 1993, p. 51.

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[18] Nair, Indira, "Decision Making in the Engineering Classroom," *Journal of Engineering Education*, October 1997, p 349-356.

[19] Mitcham, p. 128.

[20] Bush, Corlann Gee, "Women and the Assessment of Technology: To Think, To Be, To Unthink, To Free" in *Machina Ex Dea: Feminist Perspectives on Technology*, ed. Joan Rothschild, New York: Pergamon Press, 1983, p. 155.

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[22] Talbot, Stephen, *The Future Does not Compute: Transcending the Machines in Our Midst*, Sebastopol, CA: O'Reilly & Associates, 1995, p. 33.

[23] Ermer, Gayle E. and VanderLeest, Steven H., "Using Design Norms to Teach Engineering Ethics," *Proceedings of the 2002 American Society for Engineering Education (ASEE) Conference*, Montreal, Quebec, Canada, June, 2002.

[24] Monsma, p. 19, 37-57

[25] Mitcham, p. 182.

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