

Foregrounding Sustainable Values in Technology Education: Philosophical Perspectives on Design Volition

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Abstract

This article presents an investigation into the value-based affordances of volition as an integral philosophical component of technology education, specifically in relation to design methodology. As the central aspect of technology education, design has a prominent position in curricula all over the world, not just in subjects named Design and Technology, but also in most technology and engineering subjects in schools. In philosophy, it has been asserted that design *volition* (axiology) has a strong relationship with and in many ways forms the basis of design as a methodological stance. The primary philosophical frameworks used as the foundation for the philosophical analysis presented in this article are the ones introduced by Carl Mitcham in his *Thinking through Technology* (1994) and Andrew Feenberg's critical theory of technology. We perform a narrative review of relevant literature. Based on this review, we attempt a clearer definition of the lucid concept of volition/axiology in the literature, as well as explicate the relationship between axiology and methodology. In particular, we investigate this relationship in terms of values, intentionality, and sustainability in design. We review design as a societal and value-laden phenomenon, prone to strong and weak intentionality where expert and lay designers converge or diverge on sustainable values depending on the amount of interpretative flexibility. Concerning implications, school teaching needs to be founded on design volition which does not reduce technology education to technical education. Technology teachers and students need to be explicit about the values involved at all levels of technology and to clarify, justify, and debate their choices. Students must also be exposed to the way in which "sustainable values" might decrease interpretative flexibility and increase the opportunities for a technology to be sustainable in the medium to long term.

Keywords: Design, Volition, Technology Education, Philosophy of Technology, Sustainability, Sustainable Values

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Introduction

Design is a central aspect of technology education and has a prominent position in curricula all over the world in most technology and engineering subjects in schools. Design is conceived of as a broad activity including design thinking, methods, and processes where both procedural, conceptual, and contextual knowledge components interact (e.g., Williams, 2000). The methods of design can be thought of as being mainly technical, to achieve the optimal way of transforming customer requirements into products (e.g., Bertoni, 2020). On the other hand, in recent years an increasing body of literature has pointed to the fact that designs – products and systems – also embody values. Engaging in technological, engineering, or architectural design thus means not only reflecting on and producing knowledge about the designs but also embedding various values in the stages of design processes as well as in the final products (e.g., Clarke et al., 2020; Martin, 2002; Middleton, 2005; Pavlova, 2005). However, there is still a great deal of conceptual confusion surrounding both human engagement and the inclusion of values in technology education. For example, what values are and how to define various design approaches are debated issues (e.g., values-based design, as opposed to value-driven design, see Bertoni, 2020; Clarke et al., 2020). In this study, we therefore strive to philosophically clarify the notion of values and how humans through their will (volition) embed them in technological designing and designs. The aim of this article is to investigate the value-based affordances of volition as an integral philosophical component of technology education, specifically in relation to design methodology.¹

Design lends itself particularly well to philosophical analysis because it is not only a making activity but also a pattern of planning and thinking, described succinctly by Mitcham (2020): “Design [...] constitutes a distinctive way of turning making into thinking, engendering not only a special kind of making but also a unique way of thinking” (pp. 78–79). In philosophy, it has been asserted that design volition (in philosophy: axiology) has a strong relationship with and forms the basis of design as a methodological stance (Mitcham, 1994; Svenningsson et al., 2022). The primary philosophical frameworks used as the foundation for the philosophical analysis performed in this article are the ones presented by Carl Mitcham in his book *Thinking through Technology* (1994), in which he expounds on a four-dimensional conception of technology as volition, knowledge, activity, and object, and Andrew Feenberg’s critical theory of technology.

The selection of literature was carried out following a procedure for *narrative reviews*, the object of which is to identify central literature for the topic at hand in relevant databases (e.g., ERIC, Google Scholar, Unisearch)

¹ Some of the research on which this article is based has also provided material for Hallström & Ankiewicz (2023).

without following a pre-determined protocol (Demiris et al., 2019). Furthermore, we included pertinent literature that was found in reference lists in previously known philosophical and technology educational literature, or the literature found through the searches (cf., Grant & Booth, 2009). The methodology for analysis in this conceptual article subsequently consisted of a philosophical analysis of said selection of literature. The level of stringency of the philosophical argumentation ultimately decides the validity of the review and the analysis (Dusek, 2006; Hospers, 1997).

Volition in the Philosophical Literature

Volition, or in philosophical terms axiology, is an ill-defined concept that has not gained so much attention in philosophy as, for example, epistemology (knowledge), ontology (being), and metaphysics (reality). Volition basically means the ability or power to decide that you want to do something, for example, solve a problem, and then act upon it and take relevant action. In this context, it means the will to do or achieve something with the help of technology. In the philosophical literature, however, volition can mean many things, and Mitcham (1994) lists a number of these. Technology as volition could thus be the *will* to, through technology:

- survive or satisfy basic biological needs,
- pursue control or power,
- achieve freedom,
- obtain efficiency,
- be entrepreneurial,
- live and thrive,
- perform charity, temperance, altruism,
- exercise free will and creativity,
- create a vision of oneself as human, and
- achieve self-determination (pp. 247–250).

Thus, the human will, as expressed through technology, is both an individual act and a social/societal act, which reflects cultural and societal values; volition is a reflection of values that will lead to certain acts that, in turn, confirm said values. Overall, this means that technology is context-dependent and value-laden, and this calls for various ethical analyses of technology (Ankiewicz, 2019; Feng & Feenberg, 2009; Keirl, 2018).

It is here that even the failure to will – incontinence – is important ethically because it may be difficult to translate both values and knowledge into action, and sometimes we know what is right to do but we do not act accordingly. The failure of the will to do what is known to be good could potentially be “solved” by better information and communication, better education, technological fixes, political decisions, legislation, etc. However, Mitcham asserts that from St. Augustine to modernity, free will has been seen as superior to knowledge, understanding, and reason, which poses challenges when analyzing and

promoting certain technological solutions, or, conversely, when proposing that humanity must abstain from employing certain technological solutions that may, for instance, harm the environment. This, in turn, makes technological ethics all the more important (1994, pp. 258–266).

A complication in any discussion of technology, ethics, and free will is that it concerns the question of the moral “agency” also of technical artifacts and systems (Kroes & Verbeek, 2014), and thus also issues of technological autonomy, determinism, and other related phenomena (Hallström, 2022). Mitcham (1994) here bases his discourse on a Heideggerian argument, that understanding technology is essentially a practical activity and that technology in its essence is deeply related to volition; practical knowledge – procedural knowledge in making new technology – is therefore the most fundamental form of human knowledge, and it is closely connected with technological activity and volition. For Heidegger, in Mitcham’s interpretation, we can both use technology and be free of it at the same time, thus solving the dilemma of technological determinism and autonomous technology, but it requires both the will to will, and the will not to will, to say both yes and no to technology depending on the situation (1994, pp. 254–258). This Heideggerian stance may seem obscure, but it could be translated into the relationships – and tensions – between axiology and methodology in technological design.

Design Volition: Connecting Axiology and Methodology

The above discussion thus implicates a whole plethora of issues surrounding the human will to technology (and not to will), which may affect technological design in general and designing as a methodology in particular. There are important connections between axiology and methodology that need to be explored, that is, the significance of different axiological aspects of technological design and problem-solving for such activities. We will here focus particularly on three of these issues: 1. Questions of how values affect designing and the designer, 2. To what extent the will or intentionality of said designer can be considered to be decisive in designing, in comparison with values and other societal factors, and 3. The role of sustainability and sustainable values in design.

Values

We have mentioned above that technology is about control and that it is value-laden, which aligns with Feenberg’s critical theory of technology as one of the prevailing views in the field of philosophy of technology (Achterhuis, 2001; Ankiewicz, 2019). Feenberg (2006, 2009b) contrasts the impact of critical theory of technology with the impact of determinism, instrumentalism, and substantivism as the dominant views in the field of technology. He represents the relation between critical theory of technology and these other views in a table or matrix (refer to Table 1) with two axes – a vertical axis (the left column)

representing the relation of technology to values, and a horizontal axis (the top row) representing the relation of technology to control or agency (Feenberg, 2006, 2009a, 2009b).

Table 1. The relation between critical theory of technology and other views (Feenberg, 2006, 2009a, 2009b)

Technology is	Autonomous	Humanly controlled
Neutral (complete separation of means and ends)	Determinism (e.g., modernization theory)	Instrumentalism (liberal faith in progress)
Value-laden (means form a way of life that includes ends)	Substantivism (means and ends linked in systems)	Critical theory (choice of alternative means-ends systems)

Table 1 indicates that critical theory of technology shares traits with both instrumentalism and substantivism. Like instrumentalism, critical theory asserts that technology is in some sense controllable, but it also agrees with substantivism that technology is value-laden. This appears to be a precarious or even contradictory position since, in the substantivist view, the values embodied in technology such as efficiency and domination are precisely what cannot be controlled (cf., Ellul, 1964). Critical theory is skeptical about the capacity of human beings to get technological civilization under absolute control. It can, however, be reasonably controlled by being submitted to a more democratic process of design and development, also referred to as democratic intervention (Feenberg, 2006, 2009b). In this sense, critical theory of technology in Feenberg's version has developed into a critical, yet rather optimistic, view of design and technology development, provided democratic conditions prevail (Achterhuis, 2001; Ankiewicz, 2019; Hallström, 2022).

Critical theory thus develops Mitcham's (1994) conception of volition and holds that the values embodied in technology, referred to as technical codes, are socially specific and not adequately represented by such abstractions as efficiency or control evident in the dominant rationality. Technology can frame not just one way of life but many different possible ways of life or alternative rationalities, each of which leads to a different choice of designs and a different range of technological mediation (Feenberg, 2009b). On the one hand, values are realized in designs and, on the other hand, design impacts values (Feenberg, 2009a; Feng & Feenberg, 2009).

Consequently, current technical methods or standards were once broadly formulated as values and have at some time in the past been transformed into technical codes or social standards reflecting specific social requirements that have shaped design but are taken for granted today. In sociological terms, technical codes consequently are values (Riggs & Conway, 1991) and reflect what Feenberg calls secondary instrumentalizations, such as ethical and

aesthetic mediations. Secondary instrumentalization involves the power relations or socio-cultural conditions that specify definite designs (Feenberg, 2005, 2009a; Feng & Feenberg, 2009). In critical theory of technology, a technical code directs the selection of a “best” design from a number of design possibilities. In this way, the role of technical codes is similar to value-driven design (Bertoni, 2020), but the codes are in fact norms and values. Technical codes are at times explicitly formulated as design requirements or policies but are often implicit in culture, training, and education and need to be extracted from their context by means of sociological analysis. In either case, the designer should ideally formulate the technical code as an explicit norm or value directing design (Feenberg 2005, 2009a; Feng & Feenberg, 2009).

Intentionality

If technical codes can be both explicit and implicit, the intentionality of the designer becomes a central concern in design from an axiological point of view. Feng and Feenberg (2009) present three different positions on design volition: 1. Designers as powerful, with a strong intentionality, 2. Designers as constrained, with a weak intentionality, and 3. Designers as embedded in society at large and thus with questioned intentionality. Although the critical theory standpoint leans toward the third of these positions on design volition, Feng and Feenberg still conclude that in reality design may include all three of them: “The intervention of non-technical influences on design takes the form of external pressures but it is also internal to the technical sphere itself. What appears technically rational to the designer is a function of many things, including her training and the codified outcomes of technological choices made in the past under various social influences. In other words, even when engaging in ‘purely technical’ activities, designers are guided by rules that are culturally specific and value-laden” (2009, p. 110).

Design is, therefore, a societal activity implicitly or explicitly codified by historical choices, at the same time as it is also directed toward the future by being about problem-solving, creativity, and innovation (Feenberg, 2017). Therefore, both the history and the current state of the art in technology set limits for what can be achieved in design, so there is also a deterministic potential that may lead to unintended consequences of any new technology (Van der Vleuten et al., 2017; Winner, 1986). This could be both technological determinism and social determinism, depending on what factors dominate (Hallström, 2022). However, Feen and Feenberg (2009) argue that technology is underdetermined, which means that values always determine the design and development of technology more through the technical codes than the actual technical aspects. The important thing is for designers and society at large to acknowledge this fact and make sure that technology is developed with good, democratic, and liberating values, as opposed to controlling, oppressive, and undemocratic ones: “Critical theory of technology draws attention to these

background assumptions and asks that the researcher take these seriously. Our hope is that by *questioning* technology vigorously we can help open a space for *designing* technology differently” (p. 117).

By questioning technology Feng and Feenberg (2009) thus open up for a democratic discussion of the values embedded in technological designing, which may be values related not only to a democratic society but also to sustainability in a wider sense including the physical environment that surrounds us. Because human actions may have unintended consequences for humans and other species on the planet (Winner, 1986), such values also have to do with human – and technological – intentionality. We have shown how critical theory foregrounds volition in the sense that technology development is seen as both value-laden and humanly controlled, but the human control is also restricted because of a certain “agency” or determinism in the technological environment, or at least in the way humans employ this technology (Hallström, 2022; Kroes & Verbeek, 2014). Added to this, there is the frailty of the human will which is particularly poignant when moral issues are more diffuse (Jamieson, 2014), and incontinence or failure of the will to act in a sustainable way is therefore more common (Mitcham, 1994).

Sustainability

Sustainability was originally defined in “Our common future” in conjunction with the UN Rio conference in 1987: “Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits – not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities. But technology and social organization can be both managed and improved to make way for a new era of economic growth. [...] sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs” (World Commission on Environment and Development, 1987/1997, p. 282). Sustainability has been further divided into environmental, social, and economic sustainability, although this division has garnered criticism philosophically for not looking at the problem holistically, or that other divisions or aspects of sustainability better represent the problem (e.g., Goeminne, 2011). Furthermore, the poignancy of the human dimension – volition if you will – and how humans conceive of the concepts and phenomena related to sustainability (e.g., Malt & Majid, 2023) have also been highlighted recently as a concern in relation to sustainable values.

Jamieson (2014) shows why the unintended environmental and climate consequences of value-laden technological designs may actually not be seen as moral issues at all. Normally, an individual intentionally hurting another person would be seen as morally wrong, a case of which is provided by Jamieson: “Jack intentionally steals Jill’s bicycle. In this case Jack intentionally acts in such a way as to knowingly harm another individual. Both the perpetrator and victim (Jack and Jill) are clearly identifiable, and they are closely related in time and space” (p. 149). When it comes to climate consequences such as droughts, hurricanes, or heat waves they are usually seen as being perpetrated by rich people appropriating more than their fair share of the public good, mediated through various technological designs. Jamieson (2014) extrapolates his initial analogy, so as to make his point about the vast diffusion of moral responsibility in such global climate change cases:

Acting independently, Jack and a large number of unacquainted people set in motion a chain of events that causes a large number of future people who will live in another part of the world from ever having bicycles (p. 150).

If we also presume that in many cases such environmental consequences of technology were also more or less unintended, it is easy to see why both sustainable values for designs and moral accountability for climate effects are difficult to obtain.

It follows that sustainable values need to be reflected upon and embedded already at the design stage; technology should thus be designed with sustainability in mind. Technical codes, as current social meanings and values created by social actors and expert designers, will be translated into technical facts (specifications) that will be actualized in technologies in the future. People’s experiences create the “interpretative flexibility” of technical artifacts by supplying them with notions and values that help decide which design is better for the achievement of a specific goal. Expert and dominant actors in society can influence technical codes with their experience, interests, and values, which leads to the notions of the politics of technology and operational autonomy. Subsequently, produced technical artifacts are always biased towards the interests of the groups that influence their design the most (Feenberg, 2010). Lay actors or experts on whom the values of the dominant actors and expert designers have been imposed may interpret technical artifacts differently, based on different social values that may culminate in transforming their design and thus changing the equilibrium of power within modern societies, as a kind of political act as the “democratization of technology” (cf., Perperidis, 2023). We will use the constructs of “expert designers” for what Feenberg calls key, expert, and dominant actors as well as proximate designers, and “lay designers” for lay actors or experts, technical outsiders, and non-designers (Feenberg, 2005, 2017; Feng & Feenberg, 2009).

The construct of “sustainable value” occurs frequently in the literature but is not well-defined and is under-investigated. The clearest definition of “sustainable value” is ascribed to Hart and Milstein (2003) as being the strategies and practices that will contribute to a more sustainable world and simultaneously drive shareholder value. The construct features mainly in the context of ethics, business, and management, and it focuses on sustainable value creation, or co-creation with stakeholders over a longer period (cf., Cardoni et al., 2020). We suggest that in the context of the philosophy of technology, sustainable values should optimally not be seen as contrasting with but being in harmony with the values of both the expert designers on the one side and lay designers on the other side. Sustainable values include both technical and moral values. If the will and values of lay designers are more or less similar to the designed-in values of the expert designers (Feenberg, 2017), then sustainable values could be achieved. Thus, if expert and lay designers have “shared values” it might decrease interpretative flexibility and increase the opportunities for a technology to be sustainable in the medium to long term (Cardoni et al., 2020; Feenberg, 2017).

Volition in Mitcham’s philosophical framework (1994) is based on studies of engineering design and linked to the “volition of the practitioner” (p. 159). The values of engineers, as expert designers, are dominated by the current technical codes (Feenberg, 2010) as the values of yesterday (Perperidis, 2023) but are not necessarily qualified as sustainable values of tomorrow. The values which underpin the technical codes then become the facts or technical specifications of the future when actualized in technological artifacts (Feenberg, 2017; Perperidis, 2023). However, these values might not be aligned with the values of lay designers as “shared values” and subject largely to “interpretative flexibility”, thus unsustainable in the medium to long term. A contemporary example of unsustainable values is the current debate between touchscreens and physical buttons in cars which is driven by the conflicting values of expert and lay designers. Despite the fact that public opinion is against touch interfaces because of driver distraction and increased accident risks, not to mention unsustainable energy requirements, carmakers are committed to designing ever-bigger sleek and user-friendly screens because of ergonomics and aesthetics. Touchscreens as a technology in cars will only be sustainable in the long term when the carmakers and users develop “shared values” about it.

In terms of shared, sustainable design values Keitsch (2012) argues for a combination of design approaches to achieve sustainable designs that are embraced, in Feenberg’s terminology, by both expert and lay designers, for example, ethical approaches, social interaction with users, and sustainable technological fixes. She concludes: “For sustainable design a balanced approach means: cultivate world-views, ethics and knowledge to attain triple-bottom-line goals (theoria), engaging in the development of ways to interact with stakeholders to pursue these goals (praxis) and allocating optimum resources to

support their realization (poesis). Promoting a balanced approach, industrial design can contribute with ecological and technological know-how, and with methods and tools to advance social sustainability and social inclusion” (p. 186).

Discussion: Implications for Teaching Design in Technology Education

The philosophical literature on axiology/volition was and is scarce, but Mitcham (1994) goes some way in explicating more clearly what it is and the role it plays in technology development in relation to primarily epistemology/knowledge and methodology/activity. He pinpoints several definitions of volition such as the will to satisfy needs, control, live, and thrive, and connects it with values such as power, freedom, efficiency, etc. (pp. 247–250). In recent years, Feenberg has also developed axiological analyses of design in relation to societal and cultural values, as embodied in technical codes. In both Mitcham’s and Feenberg’s work issues of intentionality, agency, autonomy, values/ethics, determinism, and consequences are dealt with in intricate but convincing philosophical analyses (Mitcham, 1994, 2020; Feenberg, 2005, 2009a, b, 2017).

Why values are important

In relation to the aim of this study, both Mitcham and Feenberg thus investigate affordances of volition/axiology for technological design and show that design methodology cannot be construed as a purely “technical” activity but axiological aspects of designers’ and society’s pursuits such as values influence designing in decisive ways. The relationships between axiology and methodology, therefore, appear both in the various ways in which the intentionality of the designer takes form (strong/weak/society), and in the ways values (technical codes) are implicitly or explicitly assigned to or embedded in designs. This article thus contributes to the field of design, technology, and engineering education by explaining *why* values are important to consider in design, and *why* one cannot assume that a designer can just do what she or he thinks is suitable but that their intentionality/volition might be restricted by various cultural factors. Such restrictions are arguably particularly troublesome when it comes to sustainable values.

The philosophical analyses of this article could, in turn, help develop the way we conceive of, analyze, and teach design in technology education. Feenberg’s critical theory of technology and Mitcham’s conception of volition support the inclusion of design volition in technology education. A technology education founded on design volition does not reduce technology education to technical education, which is based on determinism and instrumentalism that view technology as value-neutral. It will also not fall short of a critical assessment – unlike substantivism – that might explain, for instance, why some technologies, but not others, are developed in a society (Conway & Riggs, 1994; Hansen, 1997; Martin, 2002; Stables, 2017). As critical theory of technology

aims at uncovering the technical codes – which are biased by the values imposed by the strong intentionality of expert designers – and to change them to the advantage of modern democratic societies (Feenberg, 2005, 2009a, 2010), technology teachers and students need to be explicit about the values involved at all levels of technology and to clarify, justify and debate their choices (Beaumont & Steeg, 2024; Conway & Riggs, 1994; McLaren, 1997; Pavlova, 2005).

The teaching of values

An overemphasis on teaching technical values and values related to competence (Holdsworth & Conway, 1999; Pavlova, 2005) at the expense of moral values also reduces technology education to technical education. Teachers need to introduce students to the kinds of moral dilemmas they will face in everyday life as a direct result of the spread of technology (Dakers, 2005). Students thereby need to look beyond immediate usefulness and profitability to effects on non-designers, for instance, through environmental impact (Keirl, 2015; Keitch, 2012; Riggs & Conway, 1991). By attending to the context and the experience of all those involved, the range of values may be made explicit, and confidence in handling value judgments may be encouraged (Conway, 1994). Beaumont and Steeg (2024) admonish teachers to identify values that might be added to or already are embedded in design processes, where technical, social, economic, aesthetic, moral, and environmental/sustainable values might come into play. They also suggest topics for focusing on sustainable values such as when designing to challenge traditional ownership through sharing and leasing, or designing for circularity to minimize waste.

Students should furthermore be given the opportunity to reflect on their explorations of a value-based appraisal of technology in society by identifying the technical codes and allowing their reflections to influence their own approach (or technical code) to design (McLaren, 1997). Students could in this regard be accorded opportunities to not only act as expert designers, following a strong intentionality approach (Dakers, 2005), but also to follow a weak intentionality approach during negotiations with lay designers. Students should also be sensitized to how in certain situations democratic interventions are a means for the public to express its sustainable and other values and its agency or political control over technology as lay designers, by articulating values that differ from those designed-in values of the expert designers confined in the dominant programs; technological development depends not only on technical codes/values but also on moral and sustainable values (cf., Ankiewicz, 2019; Cardoni et al., 2020; Pavlova, 2005).

Competing Interests

The authors have no competing interests to declare.

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