On the Discontents of Instrumentalist Framework in Technology Assessment

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Abstract

Currently, technology assessment (TA) frameworks predominantly operate within an instrumentalist framework, conceptualizing technology as a neutral tool for achieving objectives. In this paper, I explore the limitations of an instrumentalist framework in applied technology ethics. By examining the evolution of the philosophy of technology following its empirical turn, I delve into why the instrumentalist perspective has become dominant and discuss criticisms directed at this framework. I conclude by advocating for a new research trajectory aimed at transcending the instrumentalist tradition. Such a shift is essential for advancing responsible innovation, technology, and sustainability assessments, while also fostering a more conscientious framework for applied technology ethics overall.

Keywords

Technology Assessment, Instrumentalism, Sociotechnical Systems, Philosophy of Technology, Science and Technology Studies

1. Introduction

Will technology furnish comprehensive solutions to our prevailing mega-problems? Social studies of technology are replete with critiques of such a proposition. The idea of techno-fixing complex phenomena and extensive techno-optimism are criticized as offering narrow answers to complex phenomena, at the cost of social and political interventions. Various explanations for this inclination have been posited, linking the close interplay between scientific and technological advancement, economic progress, and the expansion of individual choices. Proposals for constraining the trajectory of science and technology development are seldom embraced [1].

In this short theoretical paper, my aim is to highlight the problem of *the dominance of instrumentalist frameworks in Technology Assessment*. Technology assessment (TA) refers to the practical process of evaluating the value, risks, and societal and ethical impacts of new or emerging technologies. Examples include ELSI programs, which assess the Ethical, Legal, and Social Implications of emerging biosciences and technologies, as well as Health Technology Assessment (HTA), Medical Technology Assessment (MTA), and Environmental Technology Assessment (EnTA). Currently, there is an apparent need to develop and apply such evaluative frameworks to artificial intelligence and other information system technologies. My hypothesis is that the predominance of instrumentalism in TA contributes to the overly techno-optimist societal landscape where questioning technology as the best solution to a given problem is difficult.

My argument builds on a set of existing literature, which I present while developing my own position in this paper. First, I explore the emergence of applied technology ethics, with a particular focus on Philip Brey's (2010) [2] discussion of the philosophy of technology following its empirical turn. Next, I examine how scholars from Science and Technology Studies (STS) and social studies of technology have critiqued applied technology ethics, its 'unit of analysis,' and the dominant instrumentalist perspective in the philosophy of technology. My aim is to synthesize these discussions to argue that current Technology Assessment (TA) frameworks, rooted in applied technology ethics, are fundamentally instrumentalist. Drawing on STS scholars' critiques, I argue for the need to establish a research agenda that promotes more holistic TA frameworks. Such frameworks would

shift away from promoting a linear and overly optimistic view of scientific progress that preserves the current status quo, and would encourage critical questioning of whether technology truly is the best solution to any given problem.

Discussions about beliefs toward technology are often polarized into extremes of either pessimism or optimism [see e.g., 3, 4]. My position aligns with neither of these ends: this paper is part of a broader research project (see section for Acknowledgments) that seeks to distinguish between the harmful *and* beneficial aspects of techno-optimism. Furthermore, my goal is not to criticize the instrumentalist evaluation approach in applied technology ethics itself, but rather its dominance in discussions about the impacts of technology. I do not argue that frameworks like ELSI and other TA approaches should be discarded; on the contrary, I believe they address crucial questions in the development and implementation of technology. The problem arises when instrumentalist evaluation becomes the only perspective, rather than a complementary one.

2. Why is Technology Assessment Instrumentalist?

In his article Philosophy of Technology after the Empirical Turn, Philip Brey discusses how the philosophy of technology has evolved since the 1900s. The empirical turn emerged as a response to the 'classical approach,' which viewed technology with deep pessimism. The classical philosophy of technology (1920s-1980s) began with critiques from Heidegger, Ellul, Jonas, and Mumford, who challenged the optimistic views of technology from Enlightenment ideals. Enlightenment thinkers (17th century) saw technology as a force for progress to improve human life. However, by the 20th century, industrial growth, urbanization, and mass production led to environmental damage, social alienation, and the horrors of war, contradicting Enlightenment optimism. The Frankfurt School philosophers, such as Adorno and Horkheimer, argued in *Dialectic of Enlightenment* (1947) that the Enlightenment had betrayed its ideals, resulting in a society dominated by technical-rational philosophy that exploited both nature and humanity [2].

By the 1980s, there was a notable shift from the 'classical' paradigm. Technology began to be seen as having both positive and negative potential, rather than being solely negative. The deterministic view of technology as an unstoppable force was challenged by perspectives emphasizing human agency, social construction, and alternative development paths, especially within Science and Technology Studies (STS). Discussions also started to focus on specific technologies and their development practices, rather than viewing technology as a monolithic entity. This shift is often referred to as the empirical turn in the philosophy of technology [2, 5, 6].

Brey identifies three main categories in the empirical turn. The first, the society-oriented branch, includes neo-Heideggerians, neo-Critical Theorists, post-phenomenologists, and STS scholars. This branch analyzes the social significance of technology and its relationships with society and the environment, emphasizing concrete, empirically informed, and constructivist approaches rather than pessimistic ones [2, 6].

The second branch, engineering-oriented, stems from a more radical criticism of the classical approach, setting the primary aim of philosophy of technology to understand and describe the methodological, epistemological, and ontological issues in engineering practices and products, rather than focusing on societal impacts. This approach emphasizes descriptive accuracy and conceptual clarity of technology [2].

The third development in the empirical turn is the emergence of applied technology ethics. This field emerged alongside a growing interest in applied and professional ethics, leading to two main areas: engineering ethics, which helps engineers define professional responsibilities and tackle moral challenges, and applied ethical research, which addresses social-ethical issues related to technology. Applied technology ethics focuses on societal issues regarding the introduction and use of technology. The most significant characteristic of this influential branch—which is the focus of this paper—is its embedded feature of not aiming to "determine whether modern technology is good or bad and whether we should reject or embrace it" [2, at p. 42]. Instead, it acknowledges that "we live in a technological culture in which the constant introduction and utilization of new technologies is a normal part of how society works" and then asks how we can manage these new technologies responsibly [2, at p. 42].

In the context of this paper, Brey's narrative conveys a clear message: applied technology ethics explicitly adopts an instrumentalist stance, viewing technologies as tools for achieving practical ends rather than possessing inherent moral value. Their moral significance is seen only in how they are used.

Among the described branches, applied technology ethics is the most societally influential. According to Brey, applied technology ethics "developed largely independently from mainstream philosophy of technology" [2, at p. 42]. This reflects its evolution within a multidisciplinary and multisectoral context. Applied ethics arose to address the complex demands of rapid technological and scientific advancements [7]. Significant technological innovations and implementations are assessed within this broad field, involving a diverse group of scholars and policymakers from academia, technology companies, government offices, and other relevant areas. Applied technology ethics plays a crucial normative and evaluative role, often through technology impact assessment frameworks (TA). However, straightforward frameworks, such as ELSI, have faced significant criticism from STS scholars.

3. Why is the Instrumentalist Framework Problematic?

In this section, I examine how scholars from Science and Technology Studies (STS) have criticized *anticipatory* applied technology ethics and its '*unit of analysis*'. This criticism highlights a lack of the necessary epistemological framework to address key societal values and the politics of science in technology development. This issue has been discussed in STS literature for some time [8-14]. I have previously summarized this literature with Kamilla Karhunmaa [15] and will present a condensed version here. The existing literature does not explicitly link the problem of applied technology ethics to instrumentalism, which is the connection I aim to establish here, nor does it broaden the scope of criticism beyond bioethics and ELSI frameworks.

Anticipatory evaluative ethics is a forward-looking approach designed to systematically address ethical concerns before a technology becomes available or is implemented. Advocates of anticipatory applied technology ethics argue that without such foresight, we might "suddenly find ourselves" [16: 34] in new technological situations lacking essential ethical principles and guidelines.

The criticism primarily focuses on the *legitimating effects* of anticipatory practices. Within an ethical governance framework, anticipatory imagination often takes a regulatory approach, addressing immediate future concerns rather than engaging in philosophical thought experiments like scenario building. This approach can blur the distinction between present and future, making technological visions appear as "probable facts" that necessitate ethical scrutiny. By transforming speculative future scenarios into accepted or taken-for-granted sets of probable futures, this method has a *legitimating effect* [8, 9, 13-16]. Rooted in STS, this perspective argues that contemporary claims about the future are performative, material, and political, shaping specific visions while excluding others. These claims influence present decisions by guiding investments, attention, and resources, with expectations about technological advancements and ethical concerns serving as immediate representations of future possibilities [18-20].

Anticipatory technology ethics tends to assume the inevitability and success of the technology being assessed, thereby reinforcing a linear view of scientific progress [12]. This perspective often overlooks the uncertainty surrounding whether a technology will be developed or implemented as planned, focusing instead on its projected impact. Such a simplistic approach fails to account for the unpredictable nature of technological development and its interaction with societal factor [8, 9, 11-13]. Additionally, this uncritical stance can detach from empirical science, indulging in unrealistic "speculative bubbles" [21]. By focusing on taken-for-granted technological solutions, this approach can promote "silver bullet" technologies as ultimate fixes for complex societal issues like climate change, without addressing underlying problems such as over-consumption and material growth. This emphasis reinforces the status quo and diverts resources and attention from rethinking natural resource use and consumption [15, 22-24].

The legitimizing effect relates closely to the criticism about the *unit of analysis* in technology ethics. According to STS scholars, the focus should be on the sociotechnical system rather than just the technological artifact [25] Focusing solely on the impact of a technology artifact in TA directs attention to questions about how to manage the taken-for-granted technology rather than

questioning whether it is the best solution to a given problem. This approach risks reinforcing dominant interests by serving "as a useful tool of governance, lending legitimacy to innovations that have significant official support and momentum" [12, at p. 10-11, 14, 15]. Instead, STS scholars argue that the unit of analysis should encompass the sociotechnical system, including the historical, political, cultural, and social contexts, as well as the power dynamics and interests within which the technology is developed. Focusing on the sociotechnical system allows for a deeper understanding of the intricate interactions among artifacts, social practices, relationships, knowledge systems, and institutions [15]. This broader analysis is crucial for understanding how technological beliefs shape political and moral concepts, priorities, and expectations. While STS literature may not explicitly criticize instrumentalism, it can be inferred that the 'insufficient unit of analysis' critique implies a limitation in evaluating only technological artifacts, rather than the impacts of belief systems and expectations related to technological answers.

Instrumentalism has recently faced criticism from society-oriented philosophy of technology and sustainability scholars, particularly concerning its assumptions about moral and material ontology [26, 27][2]. The core premise of instrumentalism, a dominant view in the philosophy of technology [2, 28] is to regard technology as a value-neutral tool for achieving specific ends. This perspective leads to the widely debated but criticized notion that technologies themselves are inherently value-neutral [(e.g., 29]. Such a view restricts technology to a neutral, apolitical realm, which impedes discussions on the values technologies may inherently support or challenge.

However, the strongest criticism targets immaterial views of technology, which conceptualize technology as "cognitive activity" applied to raw materials and components to solve perceived problems [30, at p. 305; 26]. This perspective overlooks the fact that technology relies heavily on material and energy resources throughout its lifecycle [31]. Viewing technology as purely immaterial implies that it can continually replace its material foundations with greater efficiency and "green" resources without reducing consumption. Tere Vaden argues that this belief stems from a misguided confidence fostered by the temporary abundance of fossil fuels, which seemed to eliminate material constraints. Consequently, the success of modern technology is as much a product of fossil fuels as of human ingenuity. This oversight creates a disconnect between technological progress, fossil fuel-driven capitalism, and the sustainability crisis [31].

4. How to go Beyond Instrumentalism?

Up to this point, I've examined how the instrumentalist view on technology became dominant and identified some of its major flaws. How can we move beyond this perspective? Critics of instrumentalism and current technology assessment frameworks, such as the ELSI frameworks, suggest a seemingly straightforward solution: shift the focus from the technological artifact to the sociotechnical system itself [25]. Scholars from the social studies of technology argue for a holistic understanding of technologies, acknowledging their ecological and social limits [30, 32], viewing them as culturally significant products with meaningful real-world impacts [28, 33], considering the influence of social power in technology design [e.g, 34], and critically assessing technological values like efficiency and rationality as reflections of the dominant social group's preferences [26].

This might seem like a straightforward theoretical endeavor within ideal theory. However, complexities emerge in practical, non-ideal settings. Implementing "the sociotechnical system" as an evaluation framework can be challenging, but this should not discourage the effort. While developing such a framework is beyond the scope of this paper, my contribution here is to advocate for its necessity: establishing a systematic assessment framework to evaluate the ethical, social, cultural, and political implications of *both* technology artifacts *and* the belief systems, power structures, and material realities underlying technology development.

As evaluative frameworks for artificial intelligence and other information systems technologies continue to emerge, developing a holistic technology impact assessment framework becomes an important task. By considering the political, material, and cultural contexts in which these

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[2] This discussion of moral and material ontology in instrumentalism is discussed lengthier in an upcoming paper (submitted) with Richard Tutton, in the context of techno-optimism in sustainability transitions.

technologies are anticipated, promoted, and developed, such a framework could foster critical discussions about the most effective solutions for the problems that information systems aim to address. Additionally, this holistic approach would help identify when technology is genuinely the right answer to a given problem.

In this paper, my goal has been to highlight the need for a new research trajectory to update the paradigm for applied technology ethics. Moving away from the instrumentalist tradition is essential for advancing responsible innovation and sustainability assessments, and for fostering a more thoughtful framework for applied technology ethics. Additionally, this approach would encourage interdisciplinary dialogue between the philosophy of technology, particularly applied technology ethics, and the social studies of technology.

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Declaration on Generative AI

During the preparation of this work, the author used ChatGPT for grammar and spelling check. No material was produced with generative AI tools.

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