Technological Artifacts
PETER-PAUL VERBEEK AND PIETER E. VERMAAS

1. Introduction

Technological artifacts are clear-cut manifestations of technology. Our world is full of material objects made by engineers for practical uses, and through these objects technology affects society and our daily lives. The philosophical characterization of technological artifacts is less clear-cut. Carl Mitcham (1994) singles out technological objects as a separate field of philosophical analysis, beside manifestations of technology as activity, as knowledge and as volition. Yet analyzing technological artifacts will immediately invoke Mitcham’s other fields, since artifacts are made and used, which are activities, and since the demarcation of technological artifacts from artisan products and works of art is related to the types of knowledge and the aims involved in these activities. Moreover, the everyday intuition that technological artifacts are objects made by human agents is in philosophy often loosened to definitions of technological artifacts as objects that are intentionally or less intentionally selected to be used, raising issues about their demarcation from natural objects. We start by discussing those definitions and then broaden our scope to further philosophical analyses of technological artifacts and their social and cultural roles.

2. Definitions of Technological Artifacts

Technological artifacts are in general characterized narrowly as material objects made by (human) agents as means to achieve practical ends. Moreover, following Aristotle, technological artifacts are as kinds not seen as natural objects: artifacts do not exist by nature but are the products of art. This general characterization is incorporated in Risto Hilpinen’s acceptance condition: “[a]n object is an artifact made by an author only if the author accepts it as satisfying some sortal description included in his productive intention” (2004: sect. 3). This condition applies also to events and works of art; it can be restricted to technological artifacts by limiting the sortal descriptions to technological ones such as “material means to achieve practical end x.”

Unintended by-products of making (e.g. sawdust) or of experiments (e.g. false positives in medical diagnostic tests) are not artifacts for Hilpinen. Objects that result
from actions of collectives of agents but do not satisfy sortal descriptions in one of the agent's productive intentions (e.g. some paths and villages) are merely artifices. Objects made by agents but not accepted to satisfy the intended sortal descriptions are "scrap."

Hilpinen specifies making as a physical modification of an existing object or as the assembling of existing/modified objects, such that "[t]he existence and some of the properties of an artifact depend [counterfactually] on an author's intention to make an object of certain kind" (2004: sect. 1). Technological artifacts as made objects are different from natural objects in two ways: they can have physical properties that natural objects do not, and they are considered as means to ends. Hilpinen considers the borderline case in which making becomes only selecting (for including "found art" [1993: sect. VI]). If this case holds for technology, a technological artifact becomes more widely a material object accepted by its author as satisfying some technological sortal description. The difference from natural objects is then only that technological artifacts are objects considered by agents to be usable as means to practical ends.

Randall Dipert (1993: ch. 2) characterizes technological artifacts also primarily as objects made by agents but broadens his analysis to usable objects by taking artifacts as special cases of tools, which in turn are special cases of instruments. An instrument is "an object one of whose properties has been thought by someone to be a means to an end and that has been intentionally employed in this capacity." A tool is an object that "has been physically modified, intentionally, to serve as a more effective means to an end" (tools are roughly Hilpinen's artifacts). An artifact is, for Dipert, "an intentionally modified tool whose properties were intended by the agent to be recognized by an agent at a later time as having been intentionally altered for that, or some other, use." This definition also applies to events and art; technological artifacts are artifacts that serve practical purposes (1993: 17).

The characterization as usable objects is more explicit in the "Dual [structural-intentional] Nature" analysis by which technological artifacts are "(i) designed physical structures, which realize (ii) functions, which refer to human intentionality" (Kroes and Meijers 2006). Designing is analyzed as the development of use plans for objects - series of actions that include manipulations of objects - by which agents can achieve ends, and as the description of the physical structure of those objects (Vermaas and Houkes 2006). Designing, in this broad sense, turns the described objects into means (Dipert’s instruments) but does not require that the objects be modified: if existing objects - technological artifacts or natural objects - meet these descriptions, modification is unnecessary.

These three analyses relate technological artifacts to intentions of individual authors, selecting agents, or designers. A fourth approach takes distance from single agents and describes technological artifacts by societal mechanisms. Basalla (1988), for instance, has given an evolutionary account of technological artifacts in which their creation and use are determined primarily by (longer-term) cultural reproduction and selection. Artifacts are still typically made, but the ends for which they are made are related to (successful) uses over time, and typically not by the intentions of individual (creating) agents.

Characterizing technological artifacts as made objects agrees with the Aristotelian contrast between technological artifacts and natural objects but may be too strict: pieces
of flint that were selected by our predecessors seem equally technological artifacts as the ones that were carefully cut. Yet characterizing technological artifacts as usable objects may be too permissive and lead to including natural objects: the sun is often used for orientation, but it seems odd to take it as a technological artifact.

3. Technological Artifacts in Philosophy

3.1 Technological artifacts and categorization: function theories

Technological artifacts are often taken as objects with functions, as (made) means to ends (this approach has been criticized, as we discuss below). The philosophical tradition of function theory analyzes this concept of function, in part to distinguish types of technological artifacts. Functions are not the only features by which technological artifacts are categorized (see Mitcham 1994: ch. 7) but they are of particular interest because of the relation they establish between technological artifacts and human intentionality, and as part of an ongoing discussion in metaphysics about taking functions as nominal or real essences of technological artifacts (e.g. Baker 2004, Elder 2004, Thomasson 2003, Wiggins 2001: ch. 3). The analysis of functions originated to a large extent in philosophy of biology, in which analyses of biological functions were generalized to include also artifact functions. One can distinguish three approaches. In the first, fitting analyses of technological artifacts in terms of intentions of individual agents, functions are the capacities or purposes for which agents make or select artifacts (e.g. Neander 1991). In the second approach, fitting the evolutionary account of technological artifacts, functions are those capacities for which artifacts are reproduced over time (e.g. Millikan 1984, 1993). And finally Robert Cummins's (1975) approach, compatible with both the intentional and the evolutionary accounts, in which functions are causal roles of technological artifacts that contribute to their (successful) uses. In recent analyses of functions in technology these three approaches are criticized and combined to theories that take more notice of the particulars of technological functional descriptions. Beth Preston (1998) has argued for a pluralist theory in which functions of technological artifacts are described as reproduced capacities and/or as causal roles. Vermaas and Houkes (2006) have argued for a (monist) function theory that integrates elements of the three approaches.

3.2 Technological artifacts and society: Science and Technology Studies

In Science and Technology Studies, two distinct types of analysis of technological artifacts have developed. The “social construction of technology” (SCOT) approach analyzes technological artifacts as the outcomes of processes of social interaction between designers and relevant social groups (Bijker 1995). Actor-network theory (ANT), however, proposes a symmetrical approach, in which both humans and artifacts play constructing roles (Latour 1993), and in which technological artifacts are constructed and constructing at the same time. Understanding artifacts as constructions, rather than as social constructions, requires taking into account the constructing role of both humans and a variety of “non-humans,” like the material environment in which the
artifact will function and the characteristics of the materials out of which it is made. The constructing role of technological artifacts in society is often indicated with the concept of "script" (Akrich 1992), making visible that technological artifacts, similar to the script of a theater play or a movie, can prescribe specific actions to their users, like speed bumps that help to determine human driving behavior. Latour has even analyzed such forms of agency of technological artifacts in terms of morality (Latour 1992, 2002). On a more political level, Langdon Winner has analyzed the social role of technological artifacts in terms of "politics," with the help of his well-known example of the bridges on Long Island in New York over the road to Jones Beach, deliberately built very low by architect Robert Moses to prevent buses passing through, thus blocking access for poor and black people who normally use public transit (Winner 1986).

3.3 Human–artifacts relations: philosophical anthropology

In philosophical anthropology, several approaches to technological artifacts have been developed, with different analyses of the nature of the relations between humans and artifacts. The first approaches were mainly instrumentalist. Ernst Kapp (1877) approached technological artifacts as projections of human bodily organs. Related to this, Arnold Gehlen (1988) argued that human beings should be seen as "Mangelwesen," deficient beings needing technological artifacts to compensate for their poor abilities to survive in an environment to which they are not equipped by nature. Both approaches give technological artifacts the instrumental role of replacing specific human possibilities, enhancing human capacities, or relieving humans from burdensome tasks.

A second approach focuses on the alienation supposedly brought about by technological artifacts. Existential philosophers like Karl Jaspers (1951) held that society has become an apparatus of machines, bureaucracy and laborers, creating mass rule rather than authentic existence. Operating machines in a factory reduces human beings to mere appendices of the machinery, producing mass products which do not allow attachment to or engagement with them. Rather than being merely functional extensions of the human, technological artifacts are seen here as a threat to it. Their perfection could even lead to a sense of humbleness, indicated by Günther Anders (1987) as "Promethean shame" – as opposed to Prometheus' pride at having stolen fire from the Gods.

A third approach to the relations between humans and technological artifacts focuses on their interwoven character. Don Ihde (1990) developed an analysis of human–technology relations, arguing that technological artifacts do not alienate us from the lifeworld but, rather, mediate our relations to it and help to shape a technological culture. Donna Haraway (1991) and Bruno Latour (1993) even go one step further by arguing that it becomes ever more difficult actually to make a distinction between human beings and technological artifacts. With their notions of "cyborgs" (Haraway) and "hybrids" (Latour), they aim to make visible that both are interwoven to such an extent that one cannot exist without the other, since the "human" and the "technological" help to shape each other. A biological, and radical, variant of this position is transhumanism, which is defended by authors like Hans Moravec (1988) and Nick Bostrom (2005a,
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2005b), who announce the end of Homo sapiens and the advent of a transhuman life form which will be a blend of organic and technological elements.

3.4 Technological artifacts and the lifeworld: phenomenology

In close connection to anthropological approaches, phenomenological approaches to technological artifacts were developed, initially by Martin Heidegger, and later by Don Ihde and Albert Borgmann (cf. Verbeek 2005). In his early work Sein und Zeit, Heidegger analyzed the role of “tools” or “equipment” (Zeug) in the relations between human beings and their world (Heidegger 1966). In order to understand equipment, Heidegger stated, one should try to describe not its properties but how it is present to human beings when they use it. Artifacts in use typically withdraw from human attention; they submerge in human involvements with reality, which take place “through” the tool. Tools in use are “ready to hand”; they remain unnoticed, as centers of a complex structure of references and relations. Only from a distanced and observing standpoint – for instance when they break down – tools are “present at hand” objects.

In his later work, Heidegger developed a radically different approach (1977), stating that technology should not be understood in terms of artifacts, but as a way of “revealing reality” – a fundamental understanding of reality which lets us interpret it in terms of raw material, available for human manipulation. Technological artifacts do not help to shape human relations with the world any more now, but function as expressions of a specific way of taking up with reality (for an analysis of the development of Heidegger’s thinking about technological artifacts, see Verbeek 2005). Albert Borgmann (1984) has brought this analysis in closer relation to actual technological artifacts. He makes a distinction between “things” that require engaged interaction with themselves in order to be used and “devices” that impede engagement because they typically make commodities available which can be consumed without engagement with the machinery producing them. The boiler, thermostat, pipes and radiators of a central heating system deliver “warmth” as a commodity that can be consumed without active engagement, whereas a fireplace requires engaging practices like gathering wood, chopping it, and filling, poking and cleaning the hearth.

Don Ihde (1979, 1983, 1990) uses Heidegger’s tool-analysis as a starting-point for analyzing what he calls “human–technology relations.” Ihde distinguishes four such relations between human beings and technological artifacts: the embodiment relation, which resembles Heidegger’s “readiness-to-hand,” and in which humans perceive the world through the artifact, as when looking through a microscope; the hermeneutic relation, in which the artifact gives a representation of the world which requires interpretation, like reading off a thermometer; the alterity relation, in which humans experience the artifact itself, much like Heidegger’s “presence-at-hand”; and the background relation, in which technological artifacts shape a background for our experiences, like the switching on and off of the fridge. Ihde elaborated how technological artifacts, from all these human–technology relations, mediate how human beings experience and interpret the world. These mediations are not essential properties of technological artifacts, though, as Ihde indicates with the concept of multistability; human beings can appropriate them in different frameworks of interpretation and use practices, which can result in various mediating roles.
References and Further Reading


