

Theories of Technical Functions: Function Ascriptions Versus Function Assignments, Part 1

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Introduction

The notion of function plays a central role in the engineer's way of thinking. It is hard to imagine how engineers could do without function talk.² They assume that the technical artifacts they design, make, and maintain and their components all have technical functions. But what does it mean to say that a technical artifact "has" a technical function (or a functional property or feature)? This question has been troubling engineers as well as philosophers. Engineers address this problem mainly for pragmatic reasons; they are interested in knowing how to represent formally or computationally the functional properties of technical artifacts in software tools intended to support engineers in their daily work. One of the main reasons why philosophers have been interested in the notion of function is its connection with the notion of teleology, which itself raises all kinds of conceptual, metaphysical, and epistemological problems.

A problem that both engineers and philosophers run into when analyzing the notion of technical function is its relation to physical structures and human intentions. They run into this problem from, so to speak, opposite directions. From an engineering point of view, that the function of a technical artifact, such as a television set, is closely related to its physical structure is obvious, because it is the physical structure that realizes or performs the function. One of the main tasks of engineers is to design, develop, and produce physical structures that can perform all kinds of technical functions. Nevertheless, the function of a television appears to be related also to what people use it for—that is, to the intentions of human beings. A television is a means to a certain end, and that end is an end of human beings. It is in relation to human ends only that the television appears to be a means, and to have a function. In engineering practice this close relation of technical functions to human ends comes to the fore in, for instance, the early stages of design projects, in which human needs and desires have to be translated into functions and functional requirements.

Within philosophical circles the dominant starting point for analyzing technical functions is the idea that these functions are mind dependent; technical artifacts are taken to have their functions only in

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2 I am not claiming that the term "function" itself is indispensable in engineering practice. (Its use among engineers appears to be of relatively recent date; for instance, it does not figure in descriptions of the early steam engines.) The term "function" may be eliminated from engineering practice, but the notions of purpose or for-ness ("What is this for?"), to which it is closely related, cannot.

relation to human intentions.³ The reason for this perspective is that in this way it is possible to avoid the rather problematic conclusion that technical artifacts by themselves are teleological objects (i.e., are objects that by themselves have ends). In these mind-dependent views, any teleological aspect of technical functions may be traced back to teleological aspects of intentional human action (which is considered to be unproblematic); insofar as technical artifacts are *for* doing certain things, they have this “for-ness” only in relation to human ends. This, however, cannot be the whole story about technical functions because it ignores their close relation to physical structures, and it is not obvious how this aspect may be accounted for within these mind-dependent views.⁴

So engineers and philosophers, each in their own way, struggle with the role of physical structures and human intentions in explicating what it means for a technical artifact to have a function. My aim is to contribute to a clarification of these roles. I focus on the role of human intentions in mind-dependent theories of technical functions. These theories are usually presented as function *ascription* theories, because technical artifacts are considered not to have functions by themselves but only in relation to the intentions of human beings. However, as pointed out by Hansson,⁵ the notion of function ascription is ambiguous; it may be taken in a descriptive and in a performative sense. I argue that care must be taken not to confuse descriptive and performative function ascriptions in mind-dependent theories of technical function. More particularly, I intend to show that only performative function ascriptions can ground the mind dependency of technical functions. To do so it is necessary to make a distinction between epistemic and ontological theories of technical functions. Part 1 of this paper introduces this distinction and analyzes the general form of epistemic and ontological theories of technical functions. On the basis of this preparatory work, I analyze in part 2 the role of descriptive and performative function ascriptions in epistemic and ontological theories of technical functions. To illustrate their different roles, I present the outline of a theory (epistemic and ontological) of function ascriptions that is based on the way engineers conceive of and describe technical artifacts. According to this theory, functional properties of technical artifacts have a hybrid (dual) nature: They are mind dependent in the sense that they depend on performative function ascriptions, but they also depend on the physical properties of technical artifacts. According to this function ascription theory, both human intentions (involved in performative function ascriptions) and physical structures have to play a crucial role in answering the question of what it means for a technical artifact to have a function.

Epistemic Theories of Function

My focus is on technical artifacts whose functions are realized by

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- 3 See, for instance, Mark Perlman, “The Modern Philosophical Resurrection of Teleology,” *The Monist* 97:1 (2004): 3–51, and Beth Preston, “Philosophical Theories of Artifact Function,” in *Handbook of Philosophy of Technology and Engineering Sciences*, ed. Anthonie Meijers Elsevier, 2009): 213–234.
 - 4 Peter Kroes and Anthony Meijers, “The Dual Nature of Technical Artefacts,” *Studies in History and Philosophy of Science* 37 (2006): 1–4.
 - 5 Sven Ove Hansson, “Defining Technical Function,” *Studies in History and Philosophy of Science* 37 (2006): 19–22.

material/physical objects or systems (so I am not considering the functions of processes). Any such technical artifact may roughly be characterized as a physical object or construction (X) that in addition to its physical properties has one or more functional properties, namely to do something with (to ϕ , ψ with etc.). I distinguish between two different kinds of functional properties that may be attributed to an object X, namely

“X is for ϕ -ing” and

“X is a ϕ -er.”

An object with the property of being a ϕ -er is an instance of the functional artifact kind ϕ -er.⁶ An object may be for ϕ -ing without being a ϕ -er. Think of a coin that in a particular situation is being used as a screwdriver. In that context, the coin may be said to be for driving screws (for ϕ -ing), without being a screwdriver (a ϕ -er).⁷ I assume that “X is a ϕ -er” implies “X is for ϕ -ing.”⁸

Our next step is to explicate the meaning of an object “having” the property of being for ϕ -ing or being a ϕ -er. This explication may be done from an epistemic and an ontological point of view. An epistemic explication focuses on what it means for an agent A to justifiably believe (or even know) that X has the functional properties of being for ϕ -ing or being a ϕ -er. Its aim is to define justified beliefs about functional properties of X in justified beliefs about other kinds of properties of X. This aim makes sense only if justified beliefs about functional properties are not considered to be some kind of basic or primitive beliefs themselves. Ontological explications aim at defining functional properties in terms of (what are considered to be) more basic ontological properties.⁹

Epistemic theories of function have the following general form:

Agent A justifiably believes that X has the functional property of being for ϕ -ing (being a ϕ -er) if A justifiably believes that X has properties P1, . . . Pn (P1', . . . Pn').

Going through the technical function literature, epistemic function theories of this form are seldom encountered. Epistemic function theories usually take the form of function *ascription* theories (i.e., theories that specify necessary and sufficient epistemic conditions for an agent A to be justified in *ascribing* a certain functional property to a technical artifact). This appears to result from the widespread idea that ontologically technical artifacts have no intrinsic functional properties, no functional properties by themselves; they are taken to be mind-dependent (or ontologically subjective) properties.¹⁰ Functions are generally taken to be ascribed, attributed, or assigned to objects by intentional agents.

Taking over the terminology of function ascriptions and taking into account the distinction between two different kinds of functional properties, we end up with two general types of epistemic function ascription theories. The first type, to be called *theories of*

6 For a discussion of treating kinds and types as properties (universals), see Linda Wetzel, “Types and Tokens,” in *The Stanford Encyclopedia of Philosophy (Summer 2006 Edition)*, ed. Edward N. Zalta (<http://plato.stanford.edu/archives/sum2006/entries/types-tokens/>).

7 This, of course, is related to the distinction between proper and accidental functions.

8 This assumption may be questioned. Consider, for instance, a model boat; it is a boat, but it is not for transporting people or goods over water (see Paul Bloom, “Intention, History, and Artifact Concepts,” *Cognition* 60:1 (1996): 1–29, and Amie L. Thomasson, “Artifacts and Human Concepts,” in *Creations of the Mind: Essays on Artifacts and Their Representations*, ed. Stephen Laurence and Eric Margolis (Oxford: Oxford University Press, 2007): 52–73. Whether a model boat is a real boat, however, is a controversial claim; after all, the model boat is a model of a real boat (so we have to distinguish between different senses of what it means to be a real boat). I will leave these instances out of consideration.

9 See also Pieter Vermaas, “On Unification: Taking Technical Functions as Objective (and Biological Functions as Subjective),” in *Functions in Biological and Artificial Worlds: Comparative Philosophical Perspectives*, ed. Ulrich Krohs and Peter Kroes (Cambridge, MA: MIT Press, 2008): 69–87.

10 John Searle, *The Construction of Social Reality* (London: Penguin Books, 1995).

function ascription, concerns the ascription of the functional property of being for φ -ing; the second, to be called *theories of function kind ascription*, concerns the functional property of being a φ -er. Ideally, epistemic theories of ascribing functional properties should state a set of conditions, each of which is necessary and jointly sufficient for an agent A to justifiably ascribe the properties of being for φ -ing and being a φ -er to an object X:

Epistemic theory of function ascription:

Agent A is justified in ascribing the property of being for φ -ing to object X (that is, in ascribing the function of to φ to X) if agent A has justified beliefs that C1, C2, . . . , and Cn.

Epistemic theory of function kind ascription:

Agent A is justified in ascribing the property of being a φ -er to object X if agent A has justified beliefs that K1, K2, . . . , Kn.

The set of conditions K1 . . . Kn has to include the set of conditions C1 . . . Cn because, as I remarked above, function kind ascription implies the corresponding function ascription, but not the other way around.

That the notion of ascription in these epistemic theories of function ascription is interpreted in the right way is crucial. As Hansson remarks, the notion of function ascription is ambiguous between two meanings, namely a descriptive and a performative one:

A person makes a *descriptive* function ascription if she holds or expresses a belief (or similar propositional attitude) that an object has a certain function. Hence, when I tell a friend that a particular object in my violin case is a shoulder rest, I make a descriptive function ascription. A *performative* function ascription is an utterance or other action by which a person assigns or tries to assign a function to an object that the object did not have before. A decision to start using a particular cushion as a shoulder rest constitutes a performative function ascription in this sense.¹¹

In discussions about function theories, whether epistemic or ontological, this distinction is seldom taken into account. However, descriptive and performative function (kind) ascriptions are not to be confused. They are different kinds of activities. Making a descriptive function (kind) ascription is making an epistemic claim that may be true or false (justified or unjustified), whereas making a performative function (kind) ascription is not. Performative function (kind) ascriptions may be successful or not. They may play an important role in epistemic theories of function (kind) ascriptions. For instance, a person A may make a descriptive function ascription to an object X partly on the basis of her belief (or knowledge) of a performative

11 Hansson, "Defining Technical Function," 20–21.

function ascription to X by another person B (or a social group). This type of ascription is exactly, as we will see in detail in part 2, what is at issue in mind-dependent theories of function. To avoid confusion, in the following paragraphs I refer to performative function (kind) ascriptions as function (kind) *assignments*;¹² for the descriptive case, I use the expression function (kind) *ascriptions* or *attributions*.

Epistemic theories of function (kind) ascriptions are intended to explicate function (kind) ascriptions in the descriptive sense. In other words, an agent A who is justified in ascribing the property of being for φ -ing (being a φ -er) to X justifiably believes that X has the property of being for φ -ing (being a φ -er) and vice versa. So A's belief that X has the function to φ (or that the function of X is to φ) amounts to the same as A's being justified to ascribe (in the descriptive sense) the property of being for φ -ing to X. Note that in general A may be justified in holding that X has a certain functional property independent of A or anybody else assigning that functional property to X. Epistemic function ascription theories are therefore not committed to the idea that functional properties are mind dependent.

The general form of the above epistemic function (kind) ascription theories allows for the possibility that the functional properties ascribed are relational in character. This relationality is the case when the justified beliefs $C1 \dots Cn$ ($K1 \dots Kn$) not only are about the object X itself, but also refer to other items. For instance, in the ICE-theory of function proposed by Vermaas and Houkes, function ascription by an agent to an object X is defined relative to a use plan p for X and relative to an account A of the behavior of X.¹³ Thus, for an object X to have the function to φ is a *relational* property. The possibility that functional properties are relational may be made explicit by modifying the general form of epistemic theories of function (kind) ascriptions in the following way:

Epistemic theory of relational function ascription:

Agent A is justified in ascribing the property of being for φ -ing to object X relative to R (which is equivalent to ascribing the function to φ to X relative to R) if A has justified (or even true) beliefs that $C1, C2, \dots$, and Cn .

Epistemic theory of relational function kKind ascription:

Agent A is justified in ascribing the property of being a φ -er to object X relative to R' if A has justified (or even true) beliefs that that $K1, K2, \dots$, Kn .

12 See also Searle, *The Construction of Social Reality*.

13 Pieter Vermaas and Wybo Houkes, "Ascribing Functions to Technical Artefacts: A Challenge to Etiological Accounts of Functions," *British Journal for the Philosophy of Science* 54: 2 (2003): 261–289.

Here, it is assumed that the items in R and R' are the object of some of the beliefs $C1 \dots Cn$ and $K1 \dots Kn$, respectively. If not, there would be no point in relativizing the ascription of function (kind) to R (respectively R'). R (R') may contain various kinds of items; apart from use plans and an account as in the ICE-theory, it may contain items such as social groups (e.g., users, designers), social practices, or a system of which X is a part.

Ontological Theories of Function

Ontological theories of function are intended to explicate what it means for an object to have a function in the ontological sense of “have.” Again I concentrate on the properties of being for φ -ing and being a φ -er and on the general form that ontological theories of these functional properties may take. I assume that functional properties are not among the most basic ontological properties of the world (i.e., that they can be further ontologically explicated). Most ontological theories of functions explicitly or implicitly make assumptions about a (more) basic ontology of the world and then analyze the ontological status of functional properties against the background of this (more) basic ontology. Taking into account that functional properties may be construed as ontologically relational properties, I propose the following general form for ontological theories:

Ontological theory of function:

Object X has the functional property of being for φ -ing relative to S if X satisfies the conditions O1, . . . ,Oj.

Ontological theory of function kind:

Object X has the functional property of being a φ -er relative to S' if X satisfies the conditions P1, . . . ,Pk.

If we assume, as before, that “X is a φ -er” implies that X is for φ -ing, then the set of conditions O1, . . . ,Ok is a (proper) subset of the set of conditions P1, . . . ,Pk. The conditions O1, . . . ,Oj (P1, . . . ,Pk) are to be stated in terms of the basic ontological properties of X, and some of them have to refer to S (S').

As an illustration of an ontological theory of function that comes close to interpreting a function as a physical property, consider the following Cummins-style theory:¹⁴

Object X has the functional property of being for φ -ing relative to a system S with capacity ψ (i.e., has the function to φ relative to system S with capacity ψ) if:

X is part of system S, and

X has the capacity to φ , and

X's capacity to φ contributes causally to S's capacity to ψ

Given such an ontological theory of functions, it must be assumed that capacities belong to the basic ontological structure of the world. Moreover, the relation “being part of” in (i) and the causal relation in (iii) are taken to be ontological relations.

This Cummins-style theory strongly assimilates functions into the ontology of the physical world. In contrast to this approach, consider McLaughlin's ontological theory of functions.¹⁵ McLaughlin sets out to present an ontological analysis of what it means to be a technical artifact and how an artifact acquires its function. He claims that artifact functions are ontologically conferred, attributed, or

14 I call it a “Cummins-style theory” because the analytical account A is suppressed; see Robert Cummins, “Functional Analysis,” *Journal of Philosophy* 72:20 (1975): 741–765.

15 Peter McLaughlin, *What Functions Explain: Functional Explanation and Self-Reproducing Systems* (Cambridge: Cambridge University Press, 2001).

ascribed to objects by agents.¹⁶ According to McLaughlin, the function of an object is conferred onto the object through the beliefs and desires of an agent. When there are no agents, there are no purposes and therefore no functions. Thus, without agents there are no artifactual functions or artifactual categories. McLaughlin claims that “Screwdrivers, tractors, pruning knives are culturally determined functional kinds, not natural kinds.”¹⁷ Insofar as functions and function kinds exist, they exist, according to McLaughlin, relative to the mental states of human agents. Now suppose that these mental states are part of the basic ontology of the world. Then the following McLaughlin-style ontological interpretation of functions may be proposed:

Object X has the functional property of being for φ -ing (being a φ -er) relative to the mental states of agent A if Agent A has mental states in which the functional property of being for φ -ing (being a φ -er) is conferred on (attributed, ascribed to) X.

Note that in this ontological theory of functions (function kinds), the physical capacities of X play no role at all. The reason is that, according to McLaughlin, criteria for successful use in principle play no role in conferring functions upon objects.

With the help of these general forms of epistemic and ontological theories of technical functions I analyze in part 2 the role of human intentions (and of physical features) in theories of functions of technical artifacts. I end this part with some general remarks on the relations between epistemic and ontological theories of function.

The Relation Between Epistemic and Ontological Theories of Function

Given these two kinds of theories of functions, a necessary question is how they are related. Leaving aside fundamental issues about how epistemology and ontology in general are (to be) related to each other, I restrict myself to a few remarks that concern this specific case of function theories. With regard to ontological theories of function, it seems important to take into account some form of epistemic access to the ontologically defined functions. What point could there be, in particular from a pragmatic engineering point of view, in introducing an ontological definition of functions such that it would in principle be impossible to have knowledge of these functions? Assuming that we may have knowledge of part-whole relations, physical capacities, and causal relations, the Cummins-style theory satisfies this demand for knowledge. The demand of epistemic access does not imply that, in each and every case where some object X ontologically has a function, it will be possible to gain knowledge of that function. Suppose that the ontological definition of functions refers to events in the history of X (e.g., to the intentions of the

16 Note that McLaughlin uses the notion of function ascription in an ontological sense (as opposed to the epistemological sense defined above).

17 Peter McLaughlin, *What Functions Explain: Functional Explanation and Self-Reproducing Systems*, 44.

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- 18 See also Dipert's discussion of what it means for an object to be artifactual; Randall R. Dipert, *Artifacts, Art Works, and Agency* (Philadelphia: Temple University Press, 1993).
- 19 I put ontological commitments between quotation marks because this notion was originally developed by Quine for formalized theories, whereas here it is used in the context of informal theories; see Quine W. V. Quine, *From a Logical Point of View: 9 Logico-Philosophical Essays*, 2d ed. (Cambridge, MA.: Harvard University Press, 1980).

designer of X), and suppose further that we may have knowledge of the intentions of other people. Situations may occur in which all information about the relevant historic events is lost forever.¹⁸ Then, it may occur that object X has ontologically a function, knowledge of which has become impossible. In principle, however, it would have been possible to have knowledge of this function on the basis of knowledge about the relevant historic events. So, depending on general assumptions about what kind of knowledge human agents may have, ontological theories of functions should be such that they allow inprinciple knowledge of those functions. One way to ensure this possibility is to construe ontological theories of functions on the basis of the "ontological commitments" of the most viable epistemic theories of functions.¹⁹

In part 2 of this paper, I put to work the distinction between function ascriptions and function assignments, on the one hand, and between epistemic and ontological theories of functions on the other. There I show that the mind dependency of functions of technical artifacts, whether it is intended in an epistemic or ontological sense, finds its origin in function assignments. I also present an outline of an epistemic and ontological theory of functions according to which technical functions have a dual nature: they are intimately related to physical features as well as to human intentions.