

# THE VALUE OF DESIGN RESEARCH

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## AFFORDANCES AND VALUES OF TECHNICAL ARTEFACTS

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### ABSTRACT

*In this paper we critically review Gibson's notion of affordance and present an alternative interpretation of the notion of affordance for technical artefacts. This alternative notion may be of special interest to designers since it offers a more coherent picture of how values and meanings are related to designed objects.*

*Keywords: affordance, value, technical artefacts*

### 1 INTRODUCTION

Ever since the publication of the book *The psychology of everyday things* by Donald Norman (1988), the notion of affordance has had a special appeal to designers. As Norman remarks, the "concept has caught on, but not always with true understanding" and it "has taken on a life far beyond the original meaning".<sup>1</sup> For Norman the notion of affordance plays an important role in the psychological study of how people understand everyday things. He uses the term 'affordance' to refer "to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used..." (Norman 1988, p. 9). Apparently, the notion of affordance is a very attractive one for the design community for the reason that it offers a way of relating values and meanings to designed objects, in particular their values and meanings for potential users. Within the design world, however, there is disagreement about the precise meaning of the notion and what it offers (or "affords") to designers. This is not really surprising since the notion of affordance has been a problematic and contested one since it was first introduced by Gibson. It is not our intention to analyse here the various ways the notion of affordance has been appropriated by the design community and the different meanings attributed to it there. Instead we will go back to the origin of the notion in the work of Gibson in order to clarify why he introduced his notion of affordance and what is problematic about it. Our main aim is to present an alternative to Gibson's interpretation of the notion of affordance for technical artefacts. This alternative may be of special interest to designers since it offers a more coherent picture of how values and meanings can be related to designed objects.

### 2 GIBSON'S THEORY OF AFFORDANCES

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<sup>1</sup> See: [http://www.jnd.org/dn.mss/affordances\\_and\\_desi.html](http://www.jnd.org/dn.mss/affordances_and_desi.html).

## **Affordances and values of technical artefacts**

Peter Kroes, Maarten Franssen

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For our purposes the key elements of Gibson's theory of affordances may be summarized in the following way. Gibson proposed this theory as a solution to a problem in perception theory. The basic problem it is intended to solve is how it is possible for an animal to directly perceive what its environment 'has in store' for it, or affords it. How is it possible for an animal to directly perceive the meanings and values that things and events have for the animal? How does an animal perceive that a certain object affords food, has the value of food? Gibson tries to solve this problem by introducing the notion of affordances which he describes in the following way.

The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. (1979, p. 127)

This seems to imply that when an animal perceives the affordances of the environment, it perceives directly meanings and values and that somehow values and meanings are objective things of the world. This would commit the theory of affordances to an ontologically very controversial claim. Gibson is acutely aware of these radical implications of his hypothesis:

This is a radical hypothesis, for it implies that the "values" and "meanings" of things in the environment can be directly perceived. Moreover, it would explain the sense in which values and meaning are external to the perceiver. (p. 127)

He sees these implications as controversial, however, only against the background of the strict dichotomy that philosophy traditionally upholds between subject and object, between perceiver and thing perceived. Gibson emphasizes in contrast that the term 'affordance' "refers to both the environment and the animal in a way no existing term does" (*ibidem*). The affordances of things in the environment always have to be taken in relation to or with reference to the perceiving animal: "Affordances are properties with reference to the observer." (p. 143). This makes affordances relational in nature and therefore not simply objective features of the environment by itself. Instead of accepting that objective values and meanings as part of the environment are directly perceived, Gibson gives up the objective-subjective distinction and maintains that there is only one world which is neither objective nor subjective:

But actually, an affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behavior. It is both physical and psychical, yet neither. An affordance points both ways, to the environment and to the observer. (p. 129)

Being neither simply a part of the environment independently of the perceiving animal nor purely subjective, affordances are not meanings and values in a traditional sense. This is the reason why Gibson introduced his notion of affordance:

I have coined this word as a substitute for values, a term which carries an old burden of philosophical meaning. I mean simply what things furnish, for good or ill. (Gibson 1966, p. 285)

Gibson's idea that affordances are neither subjective (phenomenal, psychical) nor objective (physical) plays a pivotal role in his theory; they can be neither located exclusively in the mind of the perceiver, nor in the environment (outside

## ***Affordances and values of technical artefacts***

*Peter Kroes, Maarten Franssen*

...

world); that is why he keeps on stressing that an affordance always points both ways.

### **3 SOME PROBLEMS WITH THE NOTION OF AFFORDANCE**

Gibson's notion of affordance raises many questions. Here we will focus on two key characteristics that we think are particularly problematic and that our own interpretation of the notion of affordance is intended to avoid. These key characteristics are Gibson's treatment of facts and values (meanings) as open to perception, and Gibson's way of dealing with the subjective-objective distinction.

As regards the first point, current philosophical views of value (Scanlon 1998; Dancy 2000; Gibbard 2003) take value statements – 'This food is good' – as describing 'second-order judgments': as expressing that certain properties of the environment are relevant for the question what to believe, what to do or how to live. According to these views, values should not be conceived as objects of perception at all. What we perceive are never other than properties of the environment. To claim that these properties are valuable or normatively significant is to claim that they are reason-giving. Even if one denies that such reasons are inferred or constructed but instead holds that they are in some sense 'immediate', still this does not require the inclusion of reasons or values as objects of perception in the world. This view does not imply that value statements are either subjectively or objectively true. That depends on the nature of the 'truth makers' of value statements, that is, on the subjective or objective nature of the elements that are involved in the inference or construction of reasons or in the way reasons are given immediately. Even when value statements are interpreted as objective, as describing facts, these facts are not open to perception, at least not in the sense in which everyday physical objects are open to perception. In that case a distinction has to be made between two different kinds of objective facts, one related to perception, the other to how value statements come about.

Clearly, Gibson's idea that values may be perceived directly clashes with the currently dominant philosophical views about values. This does not disqualify the idea itself, but it calls for a viable alternative to these views, which he does not offer. The same applies to Gibson's view on the subjective-objective distinction. The latter we consider to be a particularly problematic aspect of his theory of affordances.

Our main point of critique on Gibson's way of dealing with the subjective-objective distinction is that he does not distinguish between ontological and epistemological senses of this distinction. In our opinion this is precisely one of the reasons why his treatment of the subjective-objective distinctions is at times so puzzling. To illustrate this, Gibson argues that an affordance cannot be simply an objective feature of the environment, since it also involves the perceiver. Because of the involvement of the perceiver, he concludes that an affordance is also somehow subjective. However, the involvement of the perceiver does not necessarily make an affordance subjective in the epistemological sense. The fact that a stone affords John (the perceiver) to step on it, because of an appropriate relation between the stone's height and the height of John's knee, does not make the obtaining of this affordance a subjective matter in the sense that it is a

## ***Affordances and values of technical artefacts***

*Peter Kroes, Maarten Franssen*

...

figment of Jon's mind. On the contrary, the relation between the height of the stone and of John's knee is an objective feature of the world. So, the affordance of the stone is a relational property of the stone, involving certain features of John, but this fact does not make the affordance epistemically a subjective feature of the world. Gibson's discussion of whether affordances are objective or subjective features of the world is rather confusing primarily because he does not clearly distinguish between the ontological and epistemological senses of the subjective-objective distinction. Had he done so, it would have been possible for him to maintain coherently that affordances are ontologically subjective (not 'out there' in the environment) and at the same time epistemologically objective. In the next section we will explain this in more detail.

### **4 AFFORDANCES AND THE SUBJECTIVE-OBJECTIVE DISTINCTION**

Following Searle (1995) we distinguish between two different senses of the subjective-objective dichotomy. In the ontological sense the distinction refers to a difference in the mode of existence of entities or properties: an entity/property is ontologically objective in case its mode of existence does not depend on any observer or any mental state and it is ontologically subjective when its mode of existence depends on any observer or any mental state. Ontologically objective properties are intrinsic properties of things and ontologically subjective properties are observer-relative. He illustrates the difference in the following way:

It is, for example, an intrinsic feature of the object in front of me that it has a certain mass and a certain chemical composition. It is partly made of wood, the cells of which are composed of cellulose fibers, and also partly of metal, which is itself composed of metal alloy molecules. All these features are intrinsic. But it is also true to say of the very same object that it is a screwdriver. When I describe it as a screwdriver, I am specifying a feature of the object that is observer or user relative. It is a screwdriver only because people use it as (or made it for the purpose of, or regard it as) a screwdriver. (pp. 9-10)

In contrast to the physico-chemical properties of the object, the property that it is a screwdriver, that is, a technical artifact with a function, is an ontologically subjective property of the world.

In the epistemological sense the distinction refers to a difference in the kinds of facts that make a judgment true or false. A judgment is epistemically objective when its truth-value only depends on matters of fact that are independent of anybody's attitude or feelings about these matters of fact, and is epistemically subjective when its truth-value depends on certain attitudes, feelings and points of view of the makers and hearers of the judgment. The judgment that a hydrogen atom has one electron is epistemically objective, whereas the judgment that this is an ugly screwdriver is epistemically subjective.

The ontological and epistemological distinctions are independent of each other; it is possible to make epistemically objective judgments about ontologically subjective and objective features of the world as well as epistemically subjective judgments about ontologically objective and subjective features. The most interesting kind of judgment for our purposes concerns epistemically objective judgments about ontologically subjective features of the world, such as the following one: "The object in front of me is a screwdriver." Depending on

## ***Affordances and values of technical artefacts***

*Peter Kroes, Maarten Franssen*

...

what kind of object is in front of me, this judgment is true or false. Its truth-value does not depend on any attitudes, feelings or points of view, so this judgment is epistemically objective. But it is an epistemically objective judgment about an ontologically subjective feature of the world.

In our opinion, this kind of judgment offers an interesting way out of Gibson's struggle with the question whether affordances are objective or subjective. There is no necessary clash between affordances being subjective and objective at the same time. However, it is crucial to be clear about the precise meanings of the notions 'objective' and 'subjective'. As we have argued above, epistemologically judgments about affordances may be objective in spite of affordances being relational to the perceiver because the fact that this stone has the affordance of being step-on-able in relation to John is independent of anybody's attitudes, feelings or point of view. Ontologically affordances may be taken to be subjective features of the world, since they are observer dependent. This means that if the affordance of the stone involves values ("this stone is good for stepping on"), we are not driven to the controversial conclusion that these values are ontologically objective ("out there in the world independent of human beings").

Since we are interested in affordances and values of technical artefacts, we will turn now briefly to the ontology of technical artefacts while keeping these distinctions in mind.

### **5 THE ONTOLOGY OF TECHNICAL ARTEFACTS**

From an ontological point of view, technical artefacts are a special kind of entities (Franssen & Kroes 2014; Kroes 2012). We limit ourselves here to physical technical artefacts; to be more precise, to technical artefacts whose functions are realized by their physical structures (such as a hair dryer, a car, a screwdriver etcetera). Technical artefacts are not simply physical objects, but physical objects with a function. So they have physical and functional properties. Both the physical and functional properties are constitutive for being a technical artifact. What makes technical artefacts objects of a special kind is that they are ontologically hybrid objects in the sense that they are constituted by ontologically objective features, their physical properties, and ontologically subjective features, their functional properties. Technical artefacts, therefore, have a 'dual nature' (Kroes 2012).

The reason why the functional properties of a technical artifact are ontologically subjective is that they are dependent on human intentions. It is only in relation to human intentions that physical objects can have functional properties. Without going into too much detail this may be explained in the following way. Let us have a look at what may be called a conceptual anatomy of the notion of a technical artifact (see Figure 1). A technical artifact is a human-made physical

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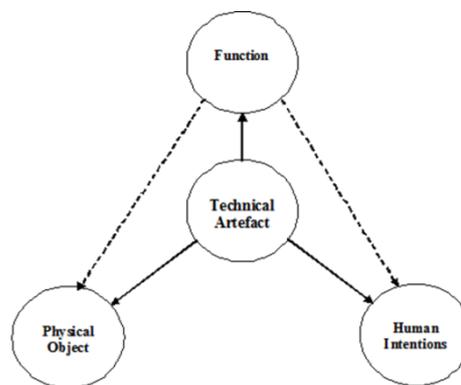


Figure 1 – A conceptual anatomy of the notion of a technical artefact.

object intended to support human beings in the realization of their ends. So, it is a means to an end and as a means it has (or is attributed) a function. But it has this function *only* in relation to these human ends; technical artefacts do not have ends by themselves. So, the function of a technical artefact cannot be dissociated from human ends, more generally from human intentions. At the same time, the function of a technical artefact cannot be dissociated from its physical structure. Not any physical structure can perform any technical function; functions must be realized by appropriate physical structures. The broken lines in Figure 1 represent these dependencies of functions on physical structures and human intentions.

We are now in a better position to understand Searle's claim that the object in front of him "is a screwdriver only because people use it as (or made it for the purpose of, or regard it as) a screwdriver". Some of the properties that are constitutive for being a screwdriver are ontologically subjective; they somehow depend on human intentions. But in spite of the fact that these functional properties are ontologically subjective, it is possible to make epistemically objective judgments about these properties; the judgment that the object in front of him is a screwdriver is objectively true.

## 6 AFFORDANCES AND VALUES OF TECHNICAL ARTEFACTS

Having all the building blocks in place we proceed to present our theory of affordances of technical artefacts. It is a deceptively simple theory. It may be summarized by the following brief statement: The affordances of technical artefacts correspond to their functions. The interpretation of affordances in terms of functions immediately makes clear that for technical artefacts it is

## ***Affordances and values of technical artefacts***

*Peter Kroes, Maarten Franssen*

...

necessary to distinguish between two kinds of affordances, namely proper and accidental affordances, in line with the distinction between proper and accidental functions. Gibson does not make such a distinction, neither for natural objects nor for technical artefacts. But such a distinction appears necessary for the affordances of technical artefacts. Among the various affordances of, for instance, a knife there is one which stands out, namely that a knife affords to cut or is for cutting. This affordance corresponds to the proper function of a knife; that is what it is designed and made for or in Gibson's terminology, what it is good for specifically. This affordance of a knife and the proper function of a knife refer to the same property of the knife, namely what it is good for. These proper affordances of technical artefacts have the following characteristics:

- they correspond to the proper functions of technical artefacts
- they are properties of technical artefacts
- they are epistemologically objective properties
- they are ontologically subjective properties
- the values associated with affordances are ontologically subjective features of technical artefacts.

The most significant difference with Gibson's notion of affordance is that these proper affordances or proper functions are not properties of technical artefacts in relation to the person who happens to perceive them or use them, but they are properties of technical artefacts by themselves. The object in front of Searle has the affordance (proper function) of driving screws independently of whether it is observed by Searle or anybody else. However, that it is a screwdriver is an ontologically subjective property of the object, because it depends on its intentional history (where the relevant intentions are the ones of its maker). Although proper affordances are properties of technical artefacts by themselves, they are relational properties, not because of the involvement of the perceiver but due to the ontologically relational nature of technical artefacts. So, our notion of affordance is in line with Gibson's in being also relational, but different because of a different choice for one of the relata.

We claim as the main advantage of our theory of affordances over Gibson's that it resolves the tension in his theory with regard to values and meanings being objective or subjective. Our interpretation of affordances as functional properties of technical artefacts does not imply that the values and meanings associated with affordances are part of the world "out there", that is, that they are ontologically objective. Such a consequence would severely undermine the viability of our theory of affordances. Technical artefacts are hybrid objects with ontologically objective and ontologically subjective properties. We have argued above that their functional properties and thus their affordances belong to the latter kind; technical artefacts have their affordances only in relation to human intentions. This means that any values and meanings associated with affordances are also ontologically subjective, that is, in line with current philosophical ideas about values and meanings finding their origin in human intentions (in the human mind).

### **7 CONCLUDING REMARKS**

In closing, let us ask what there is to be gained from the perspective of design practice by interpreting affordances and values of technical artefacts in terms of their functions? Philosophically this interpretation may be on a more secure footing than Gibson's original theory, but from the point of view of design

## ***Affordances and values of technical artefacts***

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...

practice our proposal may look more like a step backward in time. As Norman remarks, the concept of affordance “has become immensely popular” in the design community since the publication of his book (Norman 1988, p. xii). Apparently it has something positive to offer to this community. For Norman the focus on (perceived) affordances helps designers to make sure that appropriate actions with regard to the objects they design are readily perceptible by users and that inappropriate actions are made invisible. Given the enormous number of everyday things – Norman mentions an estimate of twenty thousand different sorts of things – it is indeed incumbent upon design engineers to assist users in coping with all these designed products. Here affordances come in because “[a]ffordances provide strong clues to the operations of things” (p. 9). This indeed may be one of the reasons why the notion of affordance has become so popular in the design community. There is, however, also a price to be paid for the use of the notion of affordance instead of the notion of function. This price is related to the fact that designed objects may have various affordances and that from the point of view of the theory of affordances these various affordances are all on the same footing.

As we remarked above Gibson does not distinguish between accidental and proper affordances of technical artefacts. From the point of view of the user it may be hard to tell which one of these affordances is singled out as *the* affordance for which this object was conceived and designed and which from the point of view of criteria such as efficacy and efficiency makes the object especially appropriate for one type of action. So it is not clear how, contrary to what Norman claims, affordances may “provide strong clues to the operation of things.” A characterization of a technical artefact in terms of its proper function does not suffer from this problem. Then the technical artefact comes, so to speak, with a clear message for which type of action it is particularly suited. The following quote of Norman illustrates this problem (p. 9): “A chair affords (“is for”) support and, therefore, affords sitting. A chair can also be carried. Glass is for seeing through, and for breaking.” Is it indeed the case that if a chair affords to be carried around that it is for carrying around just as it is for sitting on, and that glass is for breaking just as it is for seeing through? Not all of the affordances of designed objects are on a par; only one or some of them have played a role in the history of the design and making of the object. These and only these affordances are what the object was made for and is for and attributing a certain “forness” to a designed object is, in our opinion, just another way of saying that this designed object has a particular function and value (Kroes, 2012).

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