

The Use and Evolution of Affordance in HCI

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INTRODUCTION

The term *affordance* was coined by Gibson (1977, 1979) to define properties of objects that allow an actor to act upon them. Norman (1988) expanded on this concept and presented the concepts of real and perceptual affordances in his book *The Psychology of Everyday Things*. Norman was essentially the first to present the concept of affordance to the field of human-computer interaction (HCI).

Since then, affordance as a term has been used by many designers and researchers. But as Norman (1999) explained, many of the uses of the term are vague or unclear, which prompted the writing of his 1999 article in the *Interactions* periodical. In fact, there have been many publications that try to elucidate the term (see Hartson, 2003; McGrenere & Ho, 2000).

This article will try to provide a brief overview of the term and its many subclasses. It will try to give the reader a clear idea about what affordance is and how the concept can be used to allow designers and researchers to create better user interfaces and better interaction devices. The article however, does not try to clear up any ambiguities in the usage of the term in the literature or present a new way of viewing affordance. Rather, it tries to provide a short overview of the literature around affordance and guide the reader to a correct understanding of how to use affordance in HCI.

BACKGROUND

This section presents the evolution of the concept of affordance. It presents the creation of the term by Gibson (1977, 1979), and the way that affordance was incorporated into HCI.

Gibson's Affordance

As mentioned in the introduction, Gibson (1977, 1979) was the one who coined the term affordance to refer to the actionable properties between the world and an actor (whatever that actor may be; Gibson as cited in Norman, 1999). Gibson did not create the term to refer to any property that may be observable by the actor. Rather, he referred to all the properties that allow the actor to manipulate the world, be they perceivable or not. Thus, in Gibson's view, an affordance is just a characteristic of the environment that happens to allow an actor to act upon the environment. In this view, saying that a designer has added an affordance to a device or an interface does not immediately mean that the device or the interface has become more usable, or that the user would be able to sense the affordance in any way that would help him or her understand the usage of that device or interface. In fact, in Gibson's definition, an affordance is not there to be perceived. The affordance just exists and it is up to the actor to discover the functionality that is offered by the affordance. It is just a feature of the environment.

Norman's Affordance

Norman (1988) took the term affordance from Gibson (1977, 1979), and in his book *The Psychology of Everyday Things*, he elaborated upon it, creating something quite different from the original definition. Norman did not change the original term. Rather, he introduced the concept of perceived affordance, which defines the clues that a device or user interface gives to the user as to the functionality of an object. He also distinguished it from Gibson's affordance, which he named real affordance. We will mention probably the most used example of

affordance in HCI to clarify the difference between a real affordance and a perceived affordance. Consider a door that opens when pushed having a flat plate that takes the place of the door handle (Figure 1b). The design of the door handle gives out the clue that the door is not supposed to be pulled since there is no handle that the actor can grab in order to pull the door. Conversely, a door handle that can be grabbed (Figure 1a) gives out the clue that the door opens when pulled. However, as Norman (1988) points out, this convention is not always followed, resulting in people thinking that they cannot figure out how to open a door whereas the problem lies in bad design and bad use of a perceived affordance. The difference between the real affordance, or the affordance as defined by Gibson, and the perceived affordance in Norman's definition is that the door affords to be opened in some way but the perceived affordance that the flat panel gives out is that the door can be opened by pushing on the panel.

Norman (1988) concludes that well-designed artifacts should have perceived affordances that give out the correct clues as to the artifacts' usage and functionality.

Gaver's Affordance

Gaver (1991) wrote an article in which he also creates a definition of affordance, but he breaks affordance down into four different categories. Gaver defines perceptible affordance, false affordance, correct rejections, and hidden affordance (Figure

2). Perceptible affordance is the affordance for which there is perceptual information for the actor to perceive. This type of affordance would fall under Norman's (1988) perceived-affordance definition. Conversely, if there is information that suggests that an affordance is there when there is none, then that is a false affordance. A hidden affordance is an affordance for which no perceptual information exists. Finally, a correct rejection is the case when there is no perceptual information and no affordance.

In Gaver's (1991) terms, affordance is the existence of a special configuration of properties so that:

physical attributes of the thing to be acted upon are compatible with those of an actor, that information about those attributes is available in a form compatible with a perceptual system, and (implicitly) that these attributes and the action they make possible are relevant to a culture and a perceiver. (Gaver, 1991, p. 81)

In fact, Gaver (1991) united the two concepts of real and perceived affordance, and named the system of the property of an object and the ability of that property to be perceived as affordance.

Hartson's Affordance

Hartson (2003) used the concept of affordance to create the User Action Framework (UAF). He used the concept by basing it on Norman's (1988) definition, but also redefining it to make the distinction

Figure 1. Two door handles, one (a) very confusing as to its usage, and one (b) which gives clues as to its usage

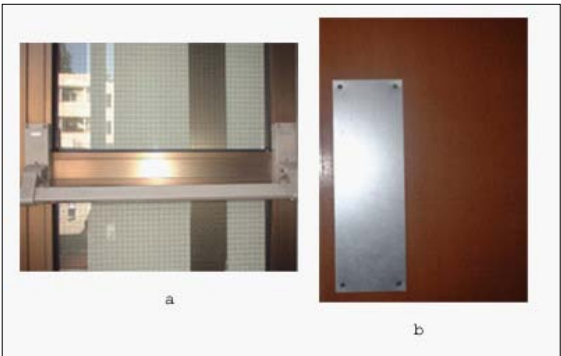
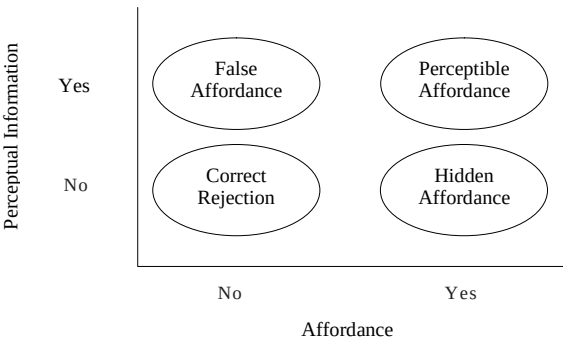


Figure 2. Separating types of affordance from information available about them (Gaver, 1991)



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