

# Breaking Affordance: Culture as Context

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## ABSTRACT

The concept of affordance as it applies to user interface design is widely used and accepted; possibly overused. This paper explores one of the constraints on affordance: culture. Graduate and undergraduate students in the United Kingdom and the United States were surveyed and asked to make judgements about the behaviour of abstracted Western-like objects. The study clearly shows that UK subjects thought the down position of a light switch indicates it is “ON”; for their US counterparts it was “OFF.” We suggest that context (in the case of this study, culture) is often overlooked, but is central to affordance, to computer interface design, as well as to action and activity more generally.

## Author Keywords

Affordance, Culture, Design Context.

## ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Human Factors.

## INTRODUCTION

Affordance is a term widely used in HCI and indeed overused. Interface and product designs are often based on some notion of affordance. Yet there is little empirical data to support the concept of affordance as a dependable one on which to base design. When attempting to design usable products for life we must question basic assumptions before making design decisions. In addition the term, as it is often used, ignores the context in which things are used and the background of the people using them. A notable exception to this is Activity Theory, which approaches affordance from a context of use perspective; seeing all activity and action as being situated in the context of use. This context is in turn influenced by the socio-cultural environment of the subjects [1,8].

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There is little evidence available for when affordances work and when they don't, even for simple things like domestic light switches. This study starts to fill the data vacuum that exists when speaking about affordance. We present empirical data that shows the importance of culture's influence on perceived affordance, even in people of 'similar but different' cultural contexts such as the United Kingdom and the United States.

## The Concept of Affordance

Gibson's term 'affordance' refers to those things that an environment offers, provides or furnishes an animal; in a way where animal and environment are complementary [1,11,14]. The term has been applied to all sorts of user interface design issues; Alan Cooper referred to the concept on a more practical level for interface design, where affordance is applied more to what users think a thing should do [3]. Norman used the term "perceived affordance" in the domain of interface design to mean the actual properties of an object that can be perceived. His definition focuses on how the object can be used by a user [11]. Donald Norman's description of affordance included cultural and social constraints; describing affordance as a phenomenon shaped by a person's previous knowledge and experience [11]. However, somewhere in its use or overuse "affordance" has lost some of its original meaning and intention [14].

When we say that an object has affordance we mean to say that we have learned that it has a particular use or it works in a particular way. Affordance becomes a tricky concept when objects found in everyday use such as switches, dials, knobs, and buttons work differently (but look similar) in different parts of the world. They become even complex when we abstract them and put them on the computer screen and, of course, user interfaces for many consumer products (e.g., mobile phones, PDAs) and web sites in particular are *expected* to have international, multicultural use.

Robert Bailey's influential *Human Performance Engineering: A Guide for Systems Designers* [2] lists recommendations for the best way of designing these everyday objects. Among his recommendations is a list for directions of movement to accomplish the "ON" and "OFF" state. Up, right, forward and pull should be used for "ON," and down, left, push for "OFF" [2]. This is seemingly straightforward until one notices that most light

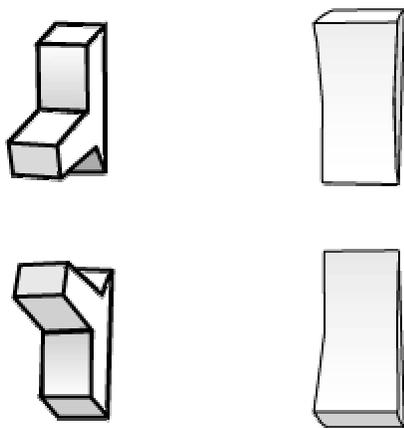


Figure 1: US style switch. Figure 2: UK style switch.

switches in (for example) Britain map down to “ON” and up to “OFF,” which is the exact opposite to the mapping in the US.

### Cultural Differences

We now want to ask if this difference in mapping in two cultures (US and UK) is enough to breakdown the affordance of the light switch. We know from the work of numerous authors that culture affects many aspects of human behaviour. Hofstede’s five cultural dimensions and Trompenaars’s seven dimensions are frequently cited in the HCI literature to explain differences in design and communication style [6, 15]. HCI researchers have found that culture influences interface design and user design preferences [4, 5, 9]. Psychologists have found that culture influences memory and judgement [10, 12]. In many ways, culture affects our context of use and our perceptions. It infuses our everyday lives.

### The Context of Use

We learn the names, properties and uses of objects within a context of use (culture for example). Objects have affordance only when we plan to or are able to use them in intended (or unintended) activity [1]. If a glass of water is perceived to be usable as a paperweight then it has afforded this use, although it may not have been designed for it.

Affordance ties in with Heidegger’s notion of ready-to-hand, as discussed by Lucy Suchman [13], and to Winograd and Flores [16] phenomenological perspectives on HCI. If the glass is never knocked over, spilling its contents, it will not lose its affordance (unready-to-hand or breakdown), say, as a paperweight. What happens when the objects we use do lose their affordance because the context of use changes? What happens when people of one culture are presented with an object they know but one that works in ways that are different from their expectations? What happens when these everyday objects are then abstracted to be used in a computerised interface?

	ON	OFF	Subjects per country
UK subjects	28	12	40
US subjects	2	43	45
<b>Total</b>	<b>30</b>	<b>55</b>	<b>85</b>

Table 1. US switch

	ON	OFF	Subjects per country
UK subjects	36	4	40
US subjects	12	33	45
<b>Total</b>	<b>48</b>	<b>37</b>	<b>85</b>

Table 2. UK switch

There is a surprising lack of data available to answer these questions so we now consider them with two student populations, one from the UK and one from the US.

### METHODOLOGY

Participants were recruited from Computer Science and Human Computer Interaction courses in the US and the UK. Both undergraduate and graduate students were sampled to ensure a wider age distribution (mean age for UK 22.9, mean age for US 27.4). The proportion of men to woman was about equal. A total of 85 participants took part; 45 from the United States and 40 from the United Kingdom. Subjects were also asked several questions probing their cultural background on a post-questionnaire. For the purposes of this study subjects were considered to be culturally of the UK or US if they had been raised and entirely educated in that country. Thus, initial screening of the subjects excluded those who had international backgrounds, such as schooling in different countries.

Subjects were presented with a questionnaire containing computer-rendered drawings of two light switch styles. One looked like a switch typically found in the United States (Figure 1) and the other like a switch typically found in the United Kingdom (Figure 2). The images were presented in a random order so that order effect would not interfere with results. Subjects were asked to make a decision as to whether the position of the light switch as presented would mean the light was “ON” or “OFF.” Each set of images was presented in both an “ON” and “OFF” position so that the user could see the switch in both states and make their own decision as to what state it was in. The directions given the user were “For the light switch pictured below, which is in the ‘ON’ position and which is in the ‘OFF’ position? Please mark each picture with either ‘ON’ or ‘OFF’.”

### RESULTS

We consider the results for the two styles of switch separately. First, the ratings for the on/off position of a US style switch are given in Table 1.

Table 1 shows a clearly significant result; UK subjects perceive this differently from US subjects ( $\chi^2 = 39.85$ ,  $p=0.000$  to 3 decimal places). From the table it is clear to see that to UK subjects thought the down position of the switch indicated it was “ON” whereas the US subjects thought it was “OFF.”

The findings in Table 2 for the UK style light switch are equally as strong ( $\chi^2 = 34.85$ ,  $p=0.000$  to 3 decimal places). Again subjects from the UK labelled the switch in the down position as “ON” and subjects in the US labelled it as “OFF.”

It is also interesting to note that only 2 US subjects incorrectly designated the US style switch, presumably the one most familiar to them. Whereas 4 UK subjects incorrectly designated the UK style switch. Furthermore there were 12 US subjects who correctly designated the UK style switch and 12 UK subjects who correctly designated the US style switch. Although these are not significant they bear further exploration.

The shape of the switch seemingly made no difference, to the perceived affordance. Although the switches have a somewhat different shape, they were treated the same by both sets of users. The result conclusively shows that the simple household light switch provides no universally understood information as to how it changes a system’s state. The affordance of the switch has been learned in a cultural context; so the design of the switch *itself* provides no actual affordance for its correct use.

## DISCUSSION

If something as seemingly simple as our understanding of the affordance of a switch can be questioned what else must we look at before we jump to design conclusions (e.g., for the web) and make assumptions? In his explanation of affordance, Norman says that, “when simple things need pictures, labels, or instructions, the design has failed” [11]. When we ignore the context of use, or the culture of our users and force them to think about which way a switch operates for “ON” the *design* is flawed as well.

If we want objects, interfaces and tools to afford their use, we must design them with a strong understanding of the users and their context. This includes previous knowledge, expertise, experience and most definitely culture.

It is easy to dismiss “simple” results such as these. In most situations *we* know if a light controlled by the switch is on or off because we can see it. Problem solving and activity usually include knowledge of the initial state, a goal or task, a subjects’ knowledge of the environment and a set of operations to change the initial state [7]. But we have to *see* these results in a greater context of usability; if we — that is, designers and users — can’t agree which direction turns a light on, then what else do we need to consider in a multicultural context?

## Critical Systems

The chances are that after many, say five or six, wrong attempts at using a light switch re-learning will occur and a person will know which way is on (or that the light has failed). This scenario may be acceptable for a light switch but may not be for a switch in a plane cockpit, for a heart monitor, a nuclear power plant, or other safety critical system! Not all systems are as forgiving as a light switch and not all systems present the initial and goal states as obviously as a light. If we are designing types of safety critical systems it is vital that we understand the cultural context of our users. That an authority on human error and system design [2] can unwittingly make a cultural error, that our simple experiment shows is significant, is a warning that there will be other potential design flaws (and/or training needs) that are not obvious to designers. And although an actual switch on a wall may prove to have a greater affordance (since the state it controls is visible) we cannot make that same claim when we abstract common objects onto a screen as we divorce them from this very visible context. Likewise, not all switches control things with obvious states.

Without this understanding we are asking our users to re-learn or even un-learn. In some cases we are even endangering them, and that defeats the purpose of user friendly design. Of course, many safety critical systems environments have highly trained users, but they may still revert to cultural norms, especially under pressure — exactly when errors will be costly.

## User Interface Design

It is often said that an icon on a screen ‘has’ an affordance to legitimise its placement there: users (and designers) have learnt that an abstracted button on a screen will do certain things. It is better to say that we have asked our users to accept or learn certain design conventions. Different users will bring different experience to the table (or computer screen as the case may be) and they will not all understand the design in the same way. Culture is an important factor in how people understand the icons and images we use [4]. Our everyday environments present us with an enormous amount of challenge; as interface designers we should aim to minimise the stress load on our users by using the understanding and knowledge they already have. We cannot do this if we ignore factors such as culture. We place an extra burden on our users if we ask them to first accept abstracted objects divorced from their normal everyday environments and then secondly ones that no longer work in the expected way.

## FUTURE WORK

This pilot study is only a beginning. There are many assumptions made in user interface design that need to be explored in the greater context of culture. If the cultural differences are not self-evident to experts then what else has been missed?

Further work on the possible impact culture has on perceived affordance will need to be done on a wide variety of interfaces, not just light switches. More broadly, culture must have a multitude of other possible effects on design, the evaluation process and use of products. The entire design process is often approached in the same way regardless of the target audience's culture; this in itself may prove to be problematic under closer inspection — for example, most user evaluation methodologies are Western (take “think aloud”) and are likely to be inappropriate in some non-Western situations (e.g., where relation to authority is different). We will be following up some of these more strategic issues in our future work.

As user populations and product markets become more and more global, HCI and business will have to consider culture as one of the key factors in design.

**The full experimental data is available from the first-named author.**

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