



What makes icons appealing? The role of processing fluency in predicting icon appeal in different task contexts



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ABSTRACT

Although icons appear on almost all interfaces, there is a paucity of research examining the determinants of icon appeal. The experiments reported here examined the icon characteristics determining appeal and the extent to which processing fluency – the subjective ease with which individuals process information – was used as a heuristic to guide appeal evaluations. Participants searched for, and identified, icons in displays. The initial appeal of icons was held constant while ease of processing was manipulated by systematically varying the complexity and familiarity of the icons presented and the type of task participants were asked to carry out. Processing fluency reliably influenced users' appeal ratings and appeared to be based on users' unconscious awareness of the ease with which they carried out experimental tasks.

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1. Introduction

Over the last 15–20 years there has been a shift in focus in human–computer interaction research, away from the sole emphasis on usability and performance towards a recognition that users' affective experience of interfaces can be at least as, and sometimes more, important than usability (e.g. Hartmann et al., 2008; Hassenzahl and Tractinsky, 2006; Mack and Sharples, 2009; Schmidt et al., 2009; Tractinsky et al., 2000). This has been particularly true of research examining website design where attracting consumers to appealing websites is paramount (Golander et al., 2012). A great deal of research has focused on getting to grips with the dizzying array of website characteristics that may contribute to user perceptions of website appeal (e.g. Cyr et al., 2010; De Wulf et al., 2006; Lavie and Tractinsky, 2004;

Moshagen and Thielsch, 2010; Thuring and Mahlke, 2007; van Schaik and Ling, 2005, 2011). In contrast, there has been little research which has investigated determinants of icon appeal² despite the fact that they are an integral part of virtually every interface. The aim of the experiments reported here was to examine the extent to which processing fluency might provide an explanation of users' perceptions of appeal.

1.1. Rapid appeal evaluations

It is now well established that users can make very rapid – almost instantaneous – evaluations of the appeal of interfaces (Handy et al., 2008; Lindgaard et al., 2006, 2011). Lindgaard et al. (2006) interpreted participants' ability to make these rapid judgements as being the result of the 'mere exposure

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² Throughout this paper the term appeal refers to mild aesthetic experiences made on the basis of simple judgements of liking by participants (see Reber et al., 2004 for a review). Liking and appeal refer to the power to attract whereas preference refers to selecting one thing over another. While similar mechanisms are thought to underpin both liking judgements and preferences, our focus in this paper is on judgements of liking/appeal.

effect'. Zajonc (1968) first showed that merely seeing something, even for the briefest of moments, is sufficient for stimulus preferences to develop. These instantaneous affective responses are therefore not thought to be the result of deliberate thought or reflection but occur automatically without conscious awareness.

In an event-related potential (ERP) study, Handy et al. (2008) examined whether processing of appeal occurred automatically with icons and logos. Participants in Handy et al.'s study were shown logos and asked to press a key when a given target logo appeared among a series of non-target logos appeared. During this task ERP responses were noted and it was only *after* the EEG recording equipment was removed that participants were asked to indicate their liking of the *non-target logos* using a 1–7 Likert scale. The key finding in this study was that ERP responses to logos within the first 200 ms of stimulus onset varied as a function of the appeal ratings which were obtained later. Handy et al. argued that we 'rapidly and implicitly evaluate ... images at a hedonic level' (p. 124).

1.2. Processing fluency and appeal evaluations

As users move beyond these first impressions, one theoretical approach which might explain changes in appeal over time is processing fluency theory (Alter and Oppenheimer, 2009; Labroo et al., 2008; Oppenheimer, 2008; Reber et al., 2004). Processing fluency refers to our experience of ease or difficulty when carrying out mental tasks. If an object is very small and distant or simply out of focus, we are aware it is hard to see; if an event is easy to retrieve from memory, we have an implicit awareness of how easy it was to access. Because this feeling of relative ease or difficulty in processing is generated by almost any cognitive process and is almost effortless to access, it can act as a cue in making judgements in a wide variety of situations (Alter and Oppenheimer, 2009; Oppenheimer, 2008).

There is compelling evidence that processing fluency when dealing with visual stimuli can act as a cue in determining judgements of appeal and preferences across a wide range of tasks (e.g. Labroo et al., 2008; Reber et al., 2004). For example, when individuals were shown stimuli against a highly contrastive background they found them more appealing than identical stimuli against a less contrastive background and pictures presented for 400 ms were preferred in comparison to those shown for 100 ms (Reber et al., 1998). When Constable et al. (2013) examined preferences for hand-painted mugs, they found that the speed with which individuals were able to find a particular mug within a search array determined their later judgements of appeal and therefore concluded that processing fluency plays a role in forming preference judgements.

As we learn stimuli, and find them easier to process and access from memory, our liking for them increases. Zizek and Reber (2004) asked participants to evaluate the appeal of letter strings after an implicit grammatical learning task. In the evaluation phase, when participants were asked to rate their liking of the letter strings, those which followed the same grammatical rules – even if not shown previously – were evaluated more positively than those which did not follow the grammatical rules participants had learnt. This could not easily be attributed to mere exposure since the strings following similar grammatical rules had not been seen before. Zizek and Reber therefore attributed these findings to the greater processing fluency resulting from their understanding of the grammatical rules that participants had learnt. Similar findings have been reported in other studies of

learnt 'grammars' (Gordon and Holyoak, 1983; Manza and Bornstein, 1995; Manza et al., 1998).

1.3. Experimental rationale

Taken together previous findings suggest that, if we find icons on an interface easy or difficult to process, then this will be reflected in the judgements we make about how appealing they are, i.e. processing fluency acts as an implicit heuristic to determine appeal judgements (i.e. preferences, subjective ratings of appeal or liking). Since patterns of performance measured using response times and accuracy *also* depend on ease of processing (see Fig. 1), it follows that appeal judgements should reflect patterns of performance made to those stimuli. More specifically, ratings of liking for icons on interfaces should reflect the speed and accuracy with which we can search for and identify icons because they both derive from ease of processing. The experiments reported here were designed to examine whether or not this was the case and the extent to which processing fluency can explain judgements of icon appeal. In the experiments which follow participants were asked to provide subjective ratings of 'liking' for icons rather than aesthetic appeal. 'Liking' was thought to be more appropriate since this is a more everyday term for appeal evaluations and more commonly used (see Constable et al., 2013; for a similar approach).

The first step in our investigation was to examine whether or not there was any kind of relationship between appeal and performance for icons. To that end, Experiment 1 sought to identify the icon characteristics predicting appeal and whether or not they are the same as known to those predict user performance. Experiments 2–4 examined whether or not judgements of appeal would reflect the changes in performance resulting from the nature of the icon stimuli presented and the tasks being carried out. Two tasks were designed to mimic searching for icons on an interface. Experiment 2 used a *search* task in which participants were presented with an icon and required to find the matching icon in an array, mimicking the search for icons with particular functions on displays. Experiments 3 and 4 used an *identification* task in which participants were given the function, or name, of the icon and then asked to find the matching icon in an array. The identification task therefore involved learning the meaning of the icons over a series of experimental trials by associating the function with the appropriate icon, reflecting the learning process that users go through as they gain experience with icon sets on interfaces. Given that the icon stimuli were the same for the search and identification tasks, it was expected that changes in evaluations of appeal between Experiment 2 versus Experiments 3 and 4 would be the product of differences in ease of processing resulting from the change in task. In Experiment 4 the icon stimuli and experimental task were the same as for Experiment 3, however, subjective ratings of liking were obtained twice from each participant, early and later in experimental trials. The aim of this manipulation was to give greater emphasis to participants' growing experience with the icons and the task over experimental trials.

1.4. Icon characteristics and task performance

Icon characteristics that have previously been shown to affect user performance include the visual complexity, concreteness, and familiarity of the icons.

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