# THE INFLUENCE OF SYMBOL ORIENTATION AND BORDER LINE THICKNESS ON SUBJECTS' PREFERENCES FOR ICON DESIGN

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Abstract: This study investigates the influence of symbol orientation and border line thickness on subjects' aesthetic preferences for icon design. Iconography, a critical element in user interface design, relies heavily on visual clarity and aesthetic appeal. Not only shape but also colour and colour combinations influence and make more complex icon design. That implies shape and colour have to be investigated both separately and in interaction. By systematically varying the orientation and border line thickness of icons, we aim to understand how these design parameters affect user preferences. A sample of participants was presented with a series of icons, each differing in orientation and border line thickness, and asked to rate their preferences. Obtained results revealed that both orientation and border line thickness were consistently rated higher in terms of visual appeal and usability. These findings have important implications for designers, suggesting that careful consideration of these variables can enhance user satisfaction and interface effectiveness.

Keywords: symbol, shape, icon, orientation, thickness

### 1. INTRODUCTION

Pictorial information is known to be the quickest to notice and comprehend as a form of information presentation (Lidwell, Holden & Butler, 2003). In many research studies, graphical images were found to be superior to text in terms of recall and recognition accuracy (Shepard, 1967). Therefore, image-related icons are considered the most effective for fast and accurate recognition (Blankenberger & Hahn, 1991; Wiedenbeck, 1999). Icons are highly efficient at communicating ideas because they transcend language barriers and present meaning in a condensed form, unlike words (Yan, 2011). Communication with a digital interface is primarily done through a direct manipulation interaction style (Shneiderman, 1982, 1983), enabling users to interact directly with on-screen elements. In everyday point-and-click tasks, people interact with user interfaces and human-machine interfaces while searching for icons of interest (Galitz, 2007).

Visual search plays a key role in identifying icons. As icon complexity increases, so does search time, due to the additional processing needed to integrate all of the icon's features into a cohesive perception (McDougall, 2006). The impact of icon complexity on search time remains significant over the long term and does not diminish with experience (McDougall, 2006).

The perception of shapes is closely related to the perception of contours. Contours provide the primary source of shape information, with the greatest curvature along the contour typically carrying the most shape information (Singh, 2015). The human visual system represents contours and shapes in parts. The visual system breaks down contours and shapes into smaller, simpler parts and organizes the perception of shapes by considering the parts of shapes and their spatial relationships (Singh, 2015). Gestalt psychologists have shown that contours contain the most information related to the perception of objects, including shape, colour, and depth (Pinna & Deiana, 2015). Not all properties of an object are perceived with the same intensity, some properties are more prominent, some less so. When asked what an object represents, the spontaneous answer is usually a description of the object based on its shape (Pinna & Deiana, 2015). It is less common for a description of an object to begin with its colour, and even rarer for it to start with attributes like volume, material quality, or other characteristics. These research results suggest that not all visual attributes have the same level of visibility; rather, they are typically organized along a complex 'gradient of visibility' and follow a certain visual syntax (Pinna & Deiana, 2015).

Shape is one of the primary factors that attract early attention. A preattentive feature implies features that guide attention during visual search and cannot be broken down into simpler features (Wolfe & Utochkin, 2019). The mechanism of early attention, commonly known as 'popout,' is referred to in professional contexts as a 'preattentive feature.' Early researchers claimed that this phenomenon occurs before the

conscious formation of attention; however, modern views suggest that the presence of attention is crucial for this effect (Ware, 2021).

Factors that are considered certain to cause early attention include:

- 1. colour;
- 2. movement;
- 3. orientation;
- 4. size.

Since the aesthetic appeal of an icon is an important factor in the likability of an interface and is crucial for ease of searching for icons, this preliminary study aims to investigate the most preferred icon design. This icon will be further examined in another experiment that utilizes colour harmonies.

### 2. METHODS

#### 2.1 Participants

A total of 95 college students (a mix of men and women, ages ranging from 18 to 25 years) participated in this preliminary study. All participants had normal or corrected vision. Participants had not participated in similar studies before.

#### 2.2 Apparatus

The preliminary study was conducted online. Stimuli were presented in a Google Forms questionnaire survey. Participants were instructed to fill out the questionnaire survey on a 24-inch monitor while seated in a chair. Responses were collected via Google Forms.

#### 2.3 Stimulus design

The stimulus used for the questionnaire survey is an icon featuring a telephone symbol on a white square background with a border. The telephone symbol was varied in orientation, and the border was varied in thickness.

#### 2.4 Preliminary study questionary survay design

The first question in the questionnaire survey was about the symbol orientation, as shown in Figure 1. Participants were presented with 11 different orientations of the telephone symbol, each rotated in steps of 15 degrees in both clockwise and counterclockwise directions. Tasked with choosing the most legible symbol, the majority of participants chose the orientations of 45 degrees and 60 degrees. Therefore, the orientation of 60 degrees was used for the questions about border line thickness.

In the second question, which focused on border line thickness, participants were asked to choose a border line that was acceptable—not too thick, as shown in Figure 2. In the third question, also about border line thickness, participants were asked to choose a border line that was acceptable—not too thin, as shown in Figure 2.



Figure 1: Stimuli for the first question in the questionnaire survey



Figure 2: Stimuli for the second and third question in the questionnaire survey

### 3. RESULTS AND DISCUSSION

The results obtained from the questionnaire survey showed (Figure 3) that most participants chose two orientations that are the most representative of this symbol. The largest number of participants (37.9%) chose the telephone symbol with a 45-degree orientation, as shown in Figure 1, number 4. Additionally, a large number of participants (33.7%) chose the telephone symbol with a 60-degree orientation, as shown in Figure 1, number 3. This implies that these two orientations are the most commonly used orientations for this symbol.



Figure 3: First question of the questionnaire survey and obtained results

In the second question, the obtained results showed (Figure 4) that most participants chose two thicknesses that are not too thin but acceptable. Most participants (29.5%) chose the border line thickness labelled as number 3, as shown in Figure 2, number 3. Additionally, a large number of participants (24.2%) chose the border line thickness labelled as number 4, as shown in Figure 2, number 4.



Figure 4: Second question of the questionnaire survey and obtained results

In the third question, the obtained results showed (Figure 5) that most participants chose two thicknesses that are not too thick but acceptable. The largest number of participants (22.1%) chose the border line thickness labelled as number 6. Additionally, a large number of participants (18.9%) chose the border line thickness labelled as number 7. There is also a significant number of participants who chose the border line thickness labelled as number 2 (14.7%) and number 5 (12.6%).



Figure 5: Third question of the questionnaire survey and obtained results

# 5. CONCLUSIONS

Preliminary research is conducted with the aim of assessing users' aesthetic appeal for icons concerning symbol orientation and border line thickness. The likability of the interface is an important factor, and it is crucial for the ease of searching for icons. This preliminary study aims to investigate the most preferred symbol orientation and border line thickness. This icon will be further examined in another experiment using colour harmonies. Results obtained from the questionnaire survey show the most preferred symbol orientation and the minimum and maximum border thicknesses. These findings have important implications for designers, suggesting that careful consideration of these variables can enhance user satisfaction and interface effectiveness.

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