Accessible Icon Design in Enterprise Applications

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ABSTRACT

We describe the challenges of designing accessible icons in enterprise software applications, such as designing status and severity indicators that retain meaning in a small 16x16 pixel icon without using color as the only visual means of conveying information.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces - *Screen design (e.g., text, graphics, color).*

General Terms

Design, Human Factors

Keywords

Accessibility, Design, Graphics, Icons, Images

1. INTRODUCTION

Graphical icons used in enterprise application software are typically created as 16x16 pixels in size. Complex meanings, such as conditional status or data trends, need to be communicated to the user in the allotted pixel space as well as conform to accessibility guidelines. The W3C Web Content Accessibility Guidelines (WCAG) 2.0 states that color should not be used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element [10]. Although product development teams may start with a graphics request for icons that are inaccessible, such as colored flag indicators differentiated only by color, the visual designer works with these requests to create a better icon solution that is accessible. In this paper, we will provide some case study examples of complex meanings that are conveyed in iconography without using color as the only means of communicating information.

2. ACCESSIBLE ICON DESIGN

As an enterprise software organization, Oracle strives to make our products accessible for people with disabilities. Accessibility is about making user interfaces perceivable, operable, and understandable by people with a wide range of abilities. In the United States, accessibility has been a requirement in the procurement of electronic and information technology by federal agencies since the 1998 Amendment to Section 508 of the Rehabilitation Act [5]. International guidelines include the Web Content Accessibility Guidelines (WCAG) from the World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI). The W3C Web Content Accessibility Guidelines (WCAG) 2.0 states that color should not be used as the only visual means of conveying information [10]. Color is often used to differentiate icons, but a visual designer should also change the icon shape. The blog at iconshock.com advises visual designers to create a set of icons with significant differentiation [9].

Our software is translated into multiple languages and used by customers around the world. Accessible icon design also needs to take globalization and internationalization into account. According to Marcus, et al., globalization refers to the worldwide production and consumption of products. Internationalization issues refer to the geographic, political, and linguistic issues of nations or groups of nations [3]. When creating icons, a visual designer needs to be aware of intercultural issues relating to religious, historical, linguistic, and aesthetic references and imagery [3]. Some things to consider include national and cultural variations in color significance, symbolism, and hand gesture interpretation.

3. FLAG ICONS

The product team had originally requested flag icons with different colored flags to represent line item status. Here are the issues with what the product team originally requested.

Using flag icons where color is the only differentiation is a direct violation of the accessibility guideline that color should not be used as the only visual means of conveying information. Using color solely to convey information would hinder individuals with color blindness from distinguishing the differentiation. According to the W3C, color blindness is a lack of sensitivity to certain colors. Common forms of color blindness include difficulty distinguishing between red and green, or between yellow and blue. Sometimes color blindness results in the inability to perceive any color [2]. Multi-colored flag icons, such as the example in Figure 1, where color is used as the only differentiation, are examples of inaccessible icons.

Figure 1. Example of inaccessible flag icons

The visual designer worked with the product team, and through discussions the resolution was to add a distinct shape to the icons. This is similar to the technique suggested by the W3C for G111: Using Color and Pattern, when color differences are used to

convey information within non-text content, patterns are included to convey the same information in a manner that does not depend on color [1]. Users who have color-blindness benefit when information conveyed by color is available in other visual ways such as shape [8]. The example in Figure 2 shows flag icons that are differentiated in both shape and color.

Figure 2. 16x16 pixel accessible flags

4. SEVERITY ICONS

Another category of icons used in enterprise software is severity icons. Severity icons are used to show progression from one level of severity to another level of severity within a set of pre-determined levels. In enterprise software, severity icons tend to relate to "real-time" data points that fluctuate and change; for example, the changing ship date for orders. The definition of severity is different than the definition of priority. According to one definition in the Merriam-Webster dictionary, severity means "of a great degree" whereas priority is a preferential rating [6, 4]. Priority can be viewed as a static preferential rating which can be denoted using a flag indicator. Severity can escalate or deescalate depending on the changing condition, and therefore the severity icons related to the data will change based on the condition.

Similar to flag icons, color should not be used as the only visual means of conveying information in severity icons. Information about the progression of the severity of the icons also needed to be clearly shown in the icon with a limited 16x16 pixel space. The design of these severity icons went through many iterations. Figure 3 shows an early brainstorm sketch of severity icon ideas.

Figure 3. Severity brainstorming sketches

From the initial brainstorming sketches, concept designs for the icons were created in black and white with the intent to communicate both severity and progression in a small space without using color as an indicator. Other considerations include the design of pre-existing icons and internationalization issues. Figure 4 shows an example of the refining the severity icon concepts.
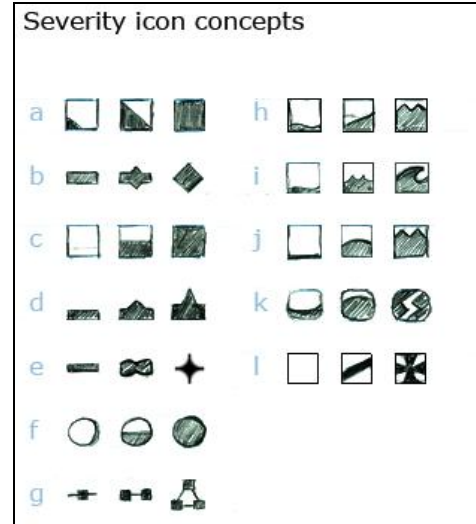

Figure 4. Refined severity concept designs

From these severity icon concept designs, the visual designer had additional discussions with the product team to narrow down the choices to a list of four final candidates for the set of severity icons. Colors such as red, orange, yellow, and green were then added to the final sets of icon candidates to finish the icons. Color was used to help indicate severity in addition to the shapes used. Figure 5 shows the final candidates for the severity icons differentiated by shapes and color.
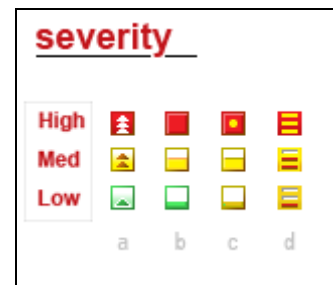

Figure 5. Severity icon final candidates

From these severity icon final candidates, the visual designer then worked with product teams to determine which candidate worked best within the context of the target pages. Figure 6 shows the chosen severity icon set in the context of an application page.

			Status		
high	🔲				
med	🔲				
low	🔲				

Available Plans

Plan	Access Level	Severity	My Status	Team Status	Last Approval Action
Bonus - 2007	Full Access	🔲	No Activity	🔳	
Salary - 2007	View Access	🔲	In Approvals	🔳	Approved by Joe smith
Stock - 2007	No Access	🔲	Budget Available	🔳	Retuned for Correction By
Sales Focal - Q107	View Access	🔲	Submitted	🔳	
Sales Focal - Q406	View Access	🔲	Fully Approved	🔳	
Stock - 2007	Full Access	🔲	No Activity	🔳	
Sales Focal - Q107	View Access	🔲	In Approvals	🔳	Approved by Joe smith
Sales Focal - Q406	No Access	🔲	Budget Available	🔳	Retuned for Correction By
Sales Focal - Q107	View Access	🔲	Submitted	🔳	
Sales Focal - Q406	View Access	🔲	Fully Approved	🔳	

Figure 6. Final severity icons in a page

5. STATUS ICONS

Status icons are used in enterprise software to communicate information about the condition of an item at a particular moment in time. According to the Merriam-Webster dictionary, status is a position or rank in relation to others [7]. Statuses of items can change. There are different types of statuses, such as a numerical positioning or indication of state.

5.1 Numerical Positioning

Numerical positioning shows status along a level of progression of numbers. This is different than status icons that graphically indicate the state of the item or object itself. Numbers can be used as a universal method of conveying the position of an item along a numerical progression. Figure 7 shows an example of numerical positioning status icons.

Figure 7. Numerical status icons

5.2 Indication of State

State indicator icons convey meaning about an item or object. In the following example, state indicator icons were needed to show both the direction of the data (up or down) and whether the movement of the data in that direction was favorable or not favorable (positive or negative). It is not always true that up means "good" and down means "bad."

For example, a stock position moving up may be considered a positive upward increase while increased time on a customer service call in a call center may be considered a negative upward increase. The resulting icon design required showing both the statuses of the icon related to the direction of data (arrow up or down) as well as the interpretation of the data on whether that change was favorable (positive or negative using the plus and minus symbols). The icons containing plus symbols were colored green to indicate a positive change, and icons containing minus symbols were colored red to indicate a negative change. Figure 8 shows an example of status icons indicating state changes.

Figure 8. State indicator status icons

6. RESEARCH / FUTURE DIRECTIONS

The severity icons for predictive analytics were shown to users during usability studies of the product designs. Four separate usability sessions that included these severity icons were conducted between March and November of 2010. These usability sessions took place in the United States, the United Kingdom, and the Netherlands. Two products were tested, and two usability sessions were conducted on each product showing iterations in the design. Findings about the icons were similar in all four usability studies. Participants did not know what the icons meant when shown in a particular area with a table. It was only by hovering on the icon that the user understood the distinctions. Even though the icons were not immediately recognized as what they represented, once they realized that they could click on the icon to get more data, participants understood what was indicated by the risk icons for predictive analytics.

For future directions, we have been developing a methodology to allow us to do more extensive icon testing. This will allow us to assess how well these icon designs are understood by users, both with and without context of an enterprise software application page. Testing icons presents a challenge in that icons are used in a specific context for a specific application on a page. Taking away the specific application context allows the user to give their interpretation of the icons based only on the contents of the 16x16 pixel image. This allows us to refine our design process and improve user interactions.

We are planning future testing with people with color blindness or low vision for accessibility, as well as testing how culture and gender inform users' interpretations of icons. This work may lead to documentation of the process of designing accessible icon graphics as well as writing a guidelines document on common issues and solutions for accessible icon design.

7. CONCLUSIONS

Enterprise applications are very complex in nature, and designing icon graphics that are accessible is a challenge. Complex meanings such as conditional status or data trends need to be communicated in a limited space of 16x16 pixels without the use of color as the only visual means of conveying information. The examples in our case study show the many design considerations for these icons to communicate complex meaning while retaining accessible design.

8. ACKNOWLEDGMENTS

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