The Effect of Visual Design in IA Products:  
A Case Study of MP3 Players on Computer Display

Chiwu Huang*, Chien-Houng Lee**

*Department of Industrial Design and Graduate Institute of Innovation and Design, National Taipei University of Technology, 1 Chung-Hsiao East Road, Section 3, Taipei 106, Taiwan,

chiwu@ntut.edu.tw

**Department of Industrial Design and Graduate Institute of Innovation and Design, National Taipei University of Technology, 1 Chung-Hsiao East Road, Section 3, Taipei 106, Taiwan,

f10091@ntut.edu.tw

Abstract: In this post-PC era, there are many IA (Information Appliance) products entering into our daily lives. The way of use in these products might be very different from our past experiences. For example, their man-machine interface might be simulated virtually on the computer display rather than in physical buttons and knobs. Many anecdotes reveal that people have difficulties in using such interface. One of the reason for the difficulties might be the interface failed to provide users with proper visual design. This study aims to explore the effect of visual design in the use of IA products. Three MP3 players on computer display and one CD player were tested. Think-aloud protocol analysis technique was used to solicit respondents’ mental responses on the tests. The tests were recorded by a digital video camera for content analysis. Interviews were also carried out to collect respondents’ comments on the use of interfaces. By synthesizing the above results, the respondents’ strategies toward the use of the tested products are identified as: 1) referring to their past experience, 2) trial and error, 3) searching auxiliary texts on the display, 4) looking for visual cues. Some design principles for improving the ease of use are also proposed: 1) use past experiences 2) allow trial and error 3) proper complexity 4) providing understandable icons 5) providing captions 6) providing visual cues 7) grouping controls.

Keywords: interface design, usability, visual cues, product semantics, bridging inference

1. Introduction

In a Hollywood scientific film, “Matrix”, people live in a world where the virtual things and real things are mixed up. Today, this scenario seems to be happening in our daily lives, though not as exaggerated as in the film. Looking around, many IA (information appliance) products already take shape in virtual form. For example, ATM (automatic teller machine) use virtual control panel on the screen as interface to interact with its user; virtual MP3 music players on the web-site look almost like a real player; the information kiosk welcomes public with a visual display etc. In addition to conveniences of the IA products brought to us, they might also change the way people interacting with machines, i.e. “language of use” [1]. A good product design needs to be easy to use. However, many electronic products today are still difficult to use. With virtual interfaces people get even more confused. For example, in an anecdotal observation, a presentation might be ruined by the incomparable signal
input/output of notebook and LCD projector. People used to be fiddling with a slide projector in a presentation in the past. Today they face with a hi-tech LCD projector. This is partly because its interface design, most often, the virtual interface on the screen.

Norman [2] argues: the gulf between designer and user is one of the reasons for product being difficult to use. Generally speaking, designers rarely talk to the users directly. They design products mostly based on their own mental models rather than users’. It seems to be very often when their concepts are inconsistent with users’ concepts the use of product becomes difficult.

Kripendorff [3] suggests three “Laws” of product semantics: 1) A product should announce what it may be used for. 2) If someone wants to use it, the product should state how to start. 3) The product should provide feedback. If a product have logic syntax, through the semantic logic the user can use “bridging inference” [4] to create a semantic context in which a product can be easily understood. A language’s semantic perception includes five elements: 1) prepositional cohesiveness [5], 2) structure cohesiveness [6], 3) external consistency [7], 4) internal consistency [8], 5) information clarity and completeness [9]. The communication of a same product language needs to be equipped with the above structures in order to form completed product semantics.

To realize a product the designer needs to go through the following four steps: 1) Identify user’s need. 2) Decide to use what kind of technology to fulfill the need. 3) Adopt the technology into a product design. 4) Provide feedback. In this process the designer is actually an interpreter who translates technology into a design language. On the one hand, a designer has to understand both mental model and life style of the user, on the other hand, he has to integrate technology into this knowledge and change them into a design language that is understood by the user. Through these design languages, i.e. shapes, signs and images, a product can tell the user what it is, how to use it, and provide feedback to the user. A language of use and user’s mental model are therefore formed.

From engineer to designer and to user, the vocabulary used to communicate to each other is actually a sign system in a form of visual language. Through syntax the vocabulary was arranged into a sentence that can be understood by the user. This translation process uses the theory of “bridging inference.” And one of requirements for bridging inference is that it has to keep prepositional cohesiveness. Function is a core prepositional theme to a product, just like the subject and pronoun in a language. Therefore we used “function fixedness” [10] as an index to identify an object. This is also called “anaphora.” Through the description of product’s functions a product’s anaphora is build up. All the receivers will keep a consistent cognitive concept to a product during the encoding process. Such a consistency in the whole process is helpful to allow user to understand a product’s language. This study aims to explore the fifth element of product semantics, i.e., the information clarity and completeness. The factors of ease of use can then be determined. This leads to the following enquiries:

1. Does visual design affect the use of a virtual interface?
2. What are the factors?
3. Can these factors lead to a design guideline?

2. Methods

This is a pilot study that aims to explore the effects of visual design in use of IA product. The usability test was used to find out the answer of the above questions. Three “Winamp” MP3 interfaces were selected
by an experienced user for their different complexity in design. Their functions and layout are the same but in different visual design. This “function fixedness” represents an “anaphora” in which three different visual designs represent three different bringing inferences. But these three interfaces can achieve the same function. This can be called “function fixedness.” Under such a fixed function through different formal vocabulary bridge the effects of different media clues in the use of IA product can be explored.

2.1 tested objects

According to the function and appearance of the interface design, three MP3 players namely, A, complex design (Figure 1); B, simple design (Figure 2) and C, standard design (Figure 3) were selected by an experienced user. The selected interfaces were different in shape, layout and color scheme.

2.2 respondents

The study aims to explore the rich variety of how the visual design of interfaces will affect the user’s operation behavior. Therefore the respondent’s representativity was not considered at this moment. The respondents were recruited according to their convenience. Six experienced users were recruited as respondents. Their average ages are between 22-29, four males and two females.

2.3 the experiment process

Think-aloud verbal protocol analysis technique was adopted to collect the responses. The technique is to have the respondents think out loud as they perform various tasks. This yields insight into underlying goals, strategies, decisions, and other cognitive components [10]. The verbal protocols were then analyzed via content analysis to identify the factors of ease of use. To avoid the learning effect, each respondent was assigned to one of three designs arbitrarily. Before test he is allowed to try it out 3 minutes freely. Then, the respondent was asked to do the following nine tasks: 1) play music, 2) adjust volume, 3) pause, 4) play next music, 5) control the sound channels, 6) stop, 7) go to previous music, 8) load a music and 9) adjust sound effects. After the tasks were done, the respondent was asked to comment on the design. Under such guidance the respondents seemed to be much more willing to comment on the interface. The test process was recorded by a Sharp 8 Viewcam video camera. The videotape was then transcribed into text to be analyzed.
3. Results and discussions

3.1 Results

Six valid tests were produced. Based on the clarity and completeness of the information supplied by the different visual interfaces, the respondents’ protocols were collected according to the following questions:
1. What factors affect the use of the interfaces?
2. Do these factors behave differently between the tested interfaces?
3. What are the expectations when the respondents have difficulties?

Through these questions the respondents’ insights about each interface can be dictated. The protocols of the respondents were then transcribed and subjected to a content analysis. The results are summarized in Table 1.

Table 1. Information found by the respondents in the tested MP3 interfaces

<table>
<thead>
<tr>
<th>Interfaces</th>
<th>Respondents</th>
<th>Comments</th>
<th>Expectations from respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>P1 and P2</td>
<td>♦ Complexity of visual design ♦ Icon design ♦ The moving text ♦ Feedbacks ♦ Mapping the icon and button ♦ The color is too dark</td>
<td>♦ Trial and error ♦ Caption ♦ Less graphics</td>
</tr>
<tr>
<td>B</td>
<td>P3 and P4</td>
<td>♦ The icon is too small ♦ The past experience in the use of Windows ♦ The color contrast is too low ♦ Difficult to use</td>
<td>♦ Trial and error ♦ Caption is needed ♦ Clear graphics</td>
</tr>
<tr>
<td>C</td>
<td>P5 and P6</td>
<td>♦ Past experiences in the use of cassette player ♦ Music title is very clear</td>
<td>♦ Trial and error ♦ Sign messages are needed</td>
</tr>
</tbody>
</table>

3.2 Discussions

3.2.1 the use of past experiences

Many respondents referred to their past experiences in using cassette player and Windows software in the test. For example, the icon on the “play”, “pause” and “stop” buttons looks like buttons on a real player. This might have helped them to decide what to do.

3.2.2 trial and error

Trial and errors were the most obvious behavior among respondents in the test. Some said when they had problem in use trial and error was the most common reaction. They thought that there should be no harm in trying something on the computer.

3.2.3 captions

When the respondents had difficulty in use, they hope the computer can provide captions to explain what are those buttons for. Feedbacks in some sort of sound or moving graphics might help.
3.2.4 graphic cues

Some respondents seem to be guided by graphic cues, for example, the icon of symmetric and strength etc. The cues include shape, size, color and texture.

3.2.5 grouping

Some respondents thought that related functions should be located near. For example, volume and equalizer should be grouped together.

3.2.6 complexity cause confusing

In A design, some respondent was difficult to find the wanted function. The complex visual style seemed to cause confusion. However, in B design, a plain design, which provides too little information, caused difficulties too.

4. Conclusion

Through the analysis of the result, visual design seems to affect the use of a virtual interface. In other words, different visual designs might have different performance in terms of ease of use. The factors affect the ease of use can be summarized as:

1. Past experience of the users
2. Complexity of design
3. Captions
4. Graphic cues, this includes shape, size, color and texture of the visual design.
5. Grouping the controls

The respondents’ strategies toward the difficulties are identified as:

1. Referring to past experiences
2. Trial and error
3. Searching auxiliary texts on the display
4. Looking for visual cues

To synthesize the above factors and strategies, the following design guidelines are proposed:

1. Use the user’s past experiences where is applicable, for example, the experience in Windows and cassette player.
2. The interfaces has to allow users to do trial and error
3. Proper complexity
4. Providing understandable icons
5. Providing captions
6. Providing visual cues
7. Grouping controls

However, further study is required to test these guidelines.
Acknowledgment

This research was sponsored by the National Science Council of Taiwan (NSC 90-2218-E-131-004).

References