Immediate Usability: Kiosk design principles from the CHI 2001 Photo Library

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ABSTRACT

This paper describes a novel set of design principles and guidelines for ensuring the *immediate usability* of public access systems. These principles and guidelines were formulated while developing PhotoFinder Kiosk, a community photo library. Attendees of CHI 2001 successfully used the tool to browse and annotate collections of photographs spanning 20 years of CHI and related conferences, producing a richly annotated photo history of the field of human-computer interaction. We used observations and log data to evaluate the tool and refine the guidelines. They provide specific guidance for practitioners, as well as a useful framework for additional research in public access interfaces.

Keywords

Photo collection, community photo library, group annotation, public access system, direct annotation, direct manipulation, drag-and-drop, immediate usability, zero-trial learning, walk-up-and-use, casual use

INTRODUCTION

Public access systems are pervasive in modern society, providing services, information and entertainment ranging from automated teller machines (ATMs) for banking to museums, government offices and unattended gas stations. They are used in retail environments to sell a variety of products such as perfume, shoes and food. Government offices use them to improve service while reducing costs. Museums are installing increasingly sophisticated interactive exhibits to educate and entertain visitors.

Early interfaces were limited to text-only displays and a small set of keys for input, but today's applications take advantage of graphical user interfaces (GUIs), touchscreens and alternative modes of input such as proximity sensors and machine vision. Recent research has also explored the use of animated "talking heads" and avatars to interact with end-users in an effort to better attract users and improve their experiences [2,4,5].

Some applications are well designed and widely used. Automated teller machines are a success story because of extensive usability testing and a concrete motivation for users. But high profile failures such as the U.S. Postal Service's Postal Buddy still occur. Many kiosks sit unused and idle because they fail to initially attract users or are simply too difficult for casual use. Designers failed to design these systems for *immediate usability*.

This paper describes a set of principles and guidelines that designers can use to develop and evaluate user interfaces for public access systems or kiosks (we use these two terms interchangeably). These guidelines are organized using a user interaction model described in [10]. We formulated the guidelines during a project to transform a personal-use photo library into a public access system. Extensive informal evaluations and observations were used to clarify and extended them. Practitioners can incorporate these guidelines into development processes, and researchers can use them to identify appropriate applications of new technologies.

BACKGROUND

These guidelines were the result of a need to transform a personal photo library tool into a public access system as part of a project to create a visual history of CHI events. One of the authors (Shneiderman) has a personal library of photos spanning 20 years of CHI-related events. These pictures have been digitized and annotated with basic metadata such as event name, date and location using PhotoFinder, a personal photo library tool. Due to the large number of photos (3300 were eventually selected from more than 7000), it was not practical for us to label or caption each picture. Even if it were, many of the people in the pictures were unknown to us (even to the photographer).

Since the CHI community was our target, we developed PhotoFinder Kiosk to enable members of this community to easily contribute their knowledge and recollections while browsing the pictures.

PhotoFinder Kiosk allows users (typically members of a common organization or community) to annotate a set of photographs with captions and name labels. Although not a true kiosk, the interface is designed to support casual use, such as would be found in a kiosk at a conference, wedding or other event that brings together a community of people

with a common interest. Users can add captions and labels to any picture, with the system maintaining the annotator's name. It encourages individual and face-to-face exploration of photo libraries, with users sharing a common PC or using a network of co-located PCs. It also allows members of the community to contribute their own pictures to the library.

PhotoFinder Kiosk was installed at CHI 2001, and attendees were invited to identify people in the pictures and add captions containing anecdotes or short stories. Attendees were also invited to contribute new pictures of the conference, either from their own digital cameras or by borrowing a camera from the exhibit. Over a three-day period, an estimated 800+ users eagerly browsed the library, adding more than 1700 labels and captions, and contributing over 1000 pictures.

PhotoFinder Kiosk was developed from PhotoFinder, a research tool for managing personal photo libraries (see http://www.cs.umd.edu/photolib) [19]. PhotoFinder is a single-user program that provides collection management and annotation, with an emphasis on easily annotating and searching for people using drag-and-drop techniques. It uses a conceptual model of a library having a set of collections, with each collection having a set of photos. Similar tools, both commercial and experimental, are available, including FotoFile [11], Shoebox [14], ACDSee, PhotoSuite, and ThumbsPlus. These tools (including PhotoFinder) are primarily intended for individual users to annotate their own collections of pictures. They generally require a small, but non-trivial investment of time to learn the annotation and searching techniques and would not be effective tools for a public access system.

Public access systems must be immediately attractive, engaging and usable to be successful. Potential users typically have no training on or prior experience with the interface. There are often competing demands for their attention, such as other exhibits or small children. And users have little incentive to invest any time learning how to use an interface, even when the content has compelling interest, because there is little expectation of future use.

Kearsley describes a four-stage model of user interaction with a public access system: attraction, learning, engagement, and disengagement. We extend this framework with a set of principles and guidelines that we call "immediate usability." These are based on our experiences on projects such as the Library of Congress (LOC) National Digital Library Program [13,16], the LOC Online Public Access Catalog [12], and the Smithsonian's Guide to Opportunities in Volunteer Archaelogy [15]. We also draw on work reported in [8].

For each of the four stages, we identify principles and guidelines for designers to consider when designing an interface. We then present examples from PhotoFinder Kiosk. It will not always be practical to implement all guidelines, but they serve as useful goals. If an interface

element cannot satisfy the guidelines, the designer should carefully consider the purpose of that element and explore alternative designs.

DEVELOPMENT AND EVALUATION

PhotoFinder Kiosk was developed in two phases. Early in the project, we considered the community members to identify typical user profiles and anticipated usage characteristics. We then considered what content would be attractive to them. We were confident that long-time CHI attendees would be attracted to the kiosk and would enjoy browsing the photos because of the pleasant memories associated with them. Our challenge with these users was to encourage them to add annotations, to help more completely identify the people and activities in the pictures. To do this, we decided to add a caption capability and tried several sizes and locations during development to make it highly visible on the screen.

For more recent attendees, though, most of the pictures are not relevant. To attract these users, we chose several techniques. First, we selected a small subset of pictures to create a collection of highlights – pictures that showed significant people and events in the CHI community. We also selected a set of humorous pictures (labeled "Outrageous") showing people in amusing poses. Finally, we decided to lend digital cameras to attendees so they could contribute pictures to the library. We would also import pictures from several digital formats so users could contribute pictures from their own digital cameras. Thus we would continually add pictures of the current conference, encouraging users to add commentary of events they had attended.

We then reviewed all PhotoFinder functions to determine which would be used in a community photo library and which could be removed. We also identified a small number of new features to be added, such as annotator identification and support for multiple libraries. The prototype was installed at the Computer-Supported Collaborative Work conference, CSCW 2000, where over 50 conference attendees used it. It was then substantially refined prior to CHI 2001 based on observations and user feedback. User-testing was employed at several points during development, and we observed users extensively during both conferences. In addition, we instrumented the software to collect usage statistics, and we distributed a short questionnaire to booth visitors at CHI 2001.

IMMEDIATE ATTRACTION
Use the most attractive content ("treasures") to demonstrate the system and invite use.

Guidelines: Organize content to highlight treasures; implement an attract sequence tailored for the audience; clearly indicate how to end the attract sequence and begin using the system; remove splash screens.

The attract sequence must clearly communicate the nature of the system, while competing with other environmental

distractions. It should invite passers by to approach, displaying content that is interesting and relevant to a wide variety of potential users, balancing familiarity and novelty [1,6]. It should clearly indicate how the visitor can start using the system (e.g. "Touch screen to begin"). It may run continuously, or be triggered by proximity sensors, infrared, sonar, pressure-sensitive mats or even machine vision [4,5].

Practice: To attract visitors, we used an oversize monitor for one of the five stations in the exhibit. When not being used by a visitor, this station displayed a sequence of photos from the current conference. We reasoned that these photos would be interesting to most of the attendees because of the novelty of seeing pictures of the same conference they were attending.

When a visitor wished to use the station, they would press the Escape key or click a button on the mouse, however, there was no specific instruction on the screen for this. Users had to guess or be told. This deficiency caused some users initial difficulty.

Several users came because their pictures had been taken at an evening event, and they wanted to make sure they were "good" pictures or else have them removed – a form of attract sequence that we had not anticipated. After finding the pictures, they chuckled and continued browsing. Several attendees remembered the CHI '89 InfoBooth [17], which allowed conference attendees to create digitized photos of themselves, and thought that we would be taking pictures for an attendee yearbook.

IMMEDIATE LEARNING

Support zero-trial learning. Users should be able to use the interface after observing others or using it themselves for a brief period of time (15-60 seconds).

Guidelines: Use the simplest practical interface; use an immediately understandable metaphor; make visible affordances for all operations and ensure that all results are immediately apparent; avoid menu bars and other elements that hide functionality; avoid UI navigation such as scrolling and jumping.

Visitors typically spend limited time using a public access system and are often unwilling or unable to invest even 60 seconds to decipher a cluttered interface or discover a hidden feature (although there are some exceptions to this, as described later). Features that are easy to learn while sitting at a home computer can be unlearnable in the public access environment. Even scanning through menus on a menu bar, which can be an effective strategy for exploring the functionality of a desktop interface, is unworkable for typical public access systems. If online help is needed, it should be extremely condensed and displayed in the context of the primary interface without obscuring it.

Figure 1: The interface for the original tool, PhotoFinder, showing the Library Viewer (left), Collection Viewer (top right) and Photo Viewer (bottom right).

Figure 2: The final interface for PhotoFinder Kiosk.

Practice: We made no changes to the fundamental metaphor of PhotoFinder. It provides a rich set of visual cues and our experience indicated that users quickly understand it [3,7,9]. We did remove unneeded management functions and ensured that the remaining functions were clearly visible in the interface. For example, we removed the menu bar from the top of the window. Most of the functions it held were already visible. The remaining functions were consolidated into a single tool bar at the bottom. A search text box replaced a slide-out search pane. This required slightly more space on the display but ensured that the search function was fully visible, and both the text box and its label serve as targets for drag-and-drop name searches.

We eliminated scrolling in the Library Viewer by limiting the number of collections in a library to 40. Individual collections, however, contain as many as 100 photos, so we retained the scrollbar when displaying large collections on the Collection Viewer, violating the guideline on eliminating scrollbars.

We also violated the guideline on visibility by retaining several non-visible features from the original program, reasoning that certain types of interactions would be familiar to our users. In practice, many users experimented with double-clicking, finding the search capability this way. The drag-and-drop feature was not obvious to users, however, most people were immediately comfortable using it to search and annotate after observing other users or reading the online help. Of 1266 searches recorded in the trace log, 692 (55%) were initiated with a double-click, 280 (22%) were initiated with drag-and-drop, and 294 (23%) were initiated by typing into the Search box. Users also appeared comfortable using the Escape key or clicking the mouse to end the slide show. Similarly, the Delete key was far more popular than the Delete button for removing annotations, being used in 82 of 88 instances (93%).

Most users needed some introduction to begin using the kiosk. This was often accomplished by watching another user for 15-60 seconds. We noticed during prototype evaluation that when that introduction was unavailable, some users would flounder. As noted in [18], the lack of an introduction "transform[ed] an easy to use system into a frustrating mystery game for some… untutored users."

To overcome this challenge, we created an overlay help system that provides task-specific help for users (see figure 3). It consists of one small window at the top of the screen with a drop-down list of tasks, and several "sticky note" style windows that vary depending on the task. The help windows are set off from the underlying display through the consistent use of a bright yellow background, large fonts and thick borders. A shadow effect would have reinforced the perception that they float over the main window. Each sticky note window is numbered, and describes one step of the task in a few words or a sentence. Sticky note windows may be individually closed, or all may be closed at once. The sticky note windows are placed to avoid obscuring

critical parts of the main window, so users can keep them visible until comfortable with the task. When the system detects 60 seconds of inactivity, the help window is automatically displayed. Users expressed satisfaction with this design, and it helped some users to more rapidly understand the interface.
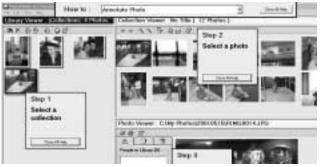

Figure 3: Detail of overlay help showing the task-oriented selection bar and sticky notes for several steps of the Annotate Photo task.

IMMEDIATE ENGAGEMENT

Encourage users to immediately interact with content; provide immediate reward; avoid interrupting users.

Guidelines: Defer login or user identification as long as possible; avoid any interactions that interrupt the user or display dialog boxes.

Once users have started using the kiosk, the user interface should be immediately transparent to them, so they can focus on the content. If it will be necessary to identify users (as is done in PhotoFinder Kiosk), that should be deferred as long as possible to allow users to engage as fully as possible before interrupting them. Any interactions that involve alert boxes, dialog boxes, or fill-in forms should be avoided because they interrupt the user. Any operation that can generate error or warning messages should be similarly avoided.

Practice: In support of the Immediate Engagement principle, we redesigned several interactions to eliminate several dialog boxes. Some functions still require a dialog box for form-fillin, such as emailing pictures (recipient email address, subject line, etc.). The original software provided no controls on access or use, as is typical with software for personal use. Because this is a public access system, it needs some level of control, but any controls must require minimal administrative support. For this reason, the program asks users for identification, but not until they add a label or caption. This avoids interrupting users when they first start exploring, allowing them to browse or search.

To evaluate the use of the kiosk, we used trace logs, a survey and informal observations of users. Due to the limitations in detecting session endings described above, we could not record the exact number of users. Also, the trace log, which recorded 259 sessions, does not include users who browsed but made no annotations. Thus the total

number of visitors cannot be estimated effectively, but was likely three to four times that number.

We received 61 completed surveys. Over half of the respondents had attended at least 5 CHI conferences and these people were more likely to contribute annotations (table 1). Of course, heavy users were more likely to answer the survey.

Conferences Attended	Number of Respondents	Annotated Pictures?	
		Yes	No
1 (first time)	9 (15%)	3 (33%)	6 (67%)
2-4	16 (26%)	8 (50%)	8 (50%)
5 or more	36 (59%)	27 (75%)	9 (25%)
Totals	61	38 (62%)	23 (38%)

Table 1: Annotation activity by the number of conferences attended.

Visitors added 1335 name annotations plus 399 captions, and attendees contributed 1180 new photos to the CHI 2001 library. Of the 1335 annotations added, 677 were for the new CHI 2001 pictures and 658 were for older photos. Of the 399 captions, 268 were for older photos and 131 were for the new CHI 2001 photos. A single user contributed 163 of the captions, all of which were for older photos. Thus the annotation activity of users was evenly divided between old and new collections, even though most of the users were long-time attendees.

We received 151 requests for a total of 2591 photos. (excluding one user who requested 399 photos), and 38 miscellaneous messages. These messages were often used to notify us of spelling and other minor errors, and a few people requested that several photos they had contributed be removed because of poor technical quality.

The photos were organized in three libraries: Historical CHI photos, other related HCI photos, and photos taken at the current CHI 2001 conference (this was initially empty). Tabs at the top of the Library Viewer selected libraries. Analysis of trace logs showed that the two CHI libraries were each selected more often than the related HCI conferences library, showing a stronger interest in the more directly relevant material (table 2). We observed that long-time conference attendees spent more time on the historical photos, while newcomers appeared to divide their time more evenly between the libraries.

Library	Number of Times Selected
CHI 2001	242 (39%)
Historical SIGCHI	221 (35%)
Other HCI	161 (26%)
Total viewings	624

Table 2: The number of times each library was selected.

The social aspect of the photos was very apparent, particularly for the long-time attendees. Visitors would often cluster around a display, sharing reminiscences. Users of separate stations would often exchange comments and point out pictures to each other. We conjecture that the availability of 5 stations contributed to user interest. Seeing several people actively engaged seems to be more compelling than just seeing one person at a PC. The experience of exploring pictures with others (even at separate stations) appears to be qualitatively different than solitary exploration.

Users arrived with various expectations and motivations. As we expected, many long-time attendees wanted to see pictures of themselves or their colleagues earlier in their careers. They found great satisfaction in adding a new name or contributing a caption, and were pleased that they could send pictures to themselves or to friends who could not attend the conference. Smiles of amusement and appreciation accompanied finding youthful pictures of friends. Some were disappointed when they didn't find any pictures of themselves. One user commented, "Apparently Ben and I do not frequent the same locations. 10 conferences, not one photo." Many users were enthusiastic, with comments such as "Great! Thanks for the memories," "This is addictive," and "The PhotoFinder rocks!" Still others volunteered to contribute pictures from their personal collections, and many offered useful suggestions for improvements and keen critiques of usability problems.

IMMEDIATE DISENGAGEMENT
When a user departs, immediately reset the system and prepare for the next visitor.

Guidelines: Use proximity sensors, infrared, sonar pressure-sensitive mats or machine vision when it is important to reset the system between users; otherwise, provide a reset button and implement an idle-timeout.

Figure 4: Three long-time CHI attendees reminiscing over photos.

Detecting the departure of a user is difficult to do within software alone. For most applications it will suffice to provide a clearly marked reset button and implement a timeout. This will often fail, however, when a user departs and another immediately arrives. When it is important or desirable to differentiate between users, additional sensors are necessary. In some applications, it may be desirable to provide a farewell to the user or otherwise confirm their departure.

Practice: We implemented a simple mechanism to detect user departure and end a session. A session was ended when the user clicked on the Sign Off button or when the system detected 60 seconds of inactivity.

This approach limited our ability to properly credit authors for their annotations. To avoid making users re-enter their names for each annotation, we saved the annotator names for the duration of a session. When users were lined up waiting to browse photos, and one user departed, the next person's annotations were frequently incorrectly attributed to the previous annotator. There was simply no way to create a short enough timeout to detect a departure without also affecting users who were simply pausing to view a photo or carry on a conversation. Asking the user to confirm their identity for each annotation might be acceptable if the name is filled-in, but would have been more intrusive.

CONCLUSION AND CONTRIBUTIONS
Public access systems are widely used, but they often suffer from poor usability for casual users. Designers need better guidelines on how to build public access interfaces. These principles and guidelines provide specific advice and concrete examples that practitioners can use to help ensure the immediate usability of public access systems. They also provide a framework for researchers to use when creating and evaluating new technologies for public interfaces.

This project was focused on a particular community – members of SIGCHI – with a specific interest in the content of PhotoFinder Kiosk. Additional testing would help validate these guidelines and broaden their applicability.

We are currently developing a web-based version of PhotoFinder Kiosk, and exploring public access issues in the context of a web application. This will be used for an online photo history of CHI on the SIGCHI website based on the photos displayed and annotated at CHI 2001.

ACKNOWLEDGEMENTS

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