Factors and Cues Impacting User Information Selection and Processing Performance in Kiosk Touch Screen Interfaces

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Abstract. Designing kiosk touch screen interfaces challenges our basic knowledge of human-computer interaction. Touch screens are used by people of all ages and educational levels for a wide variety of applications. An empirical study on a kiosk touch screen design was conducted to test the cues and factors influencing user performance by examining design elements and principles from a designer's perspective and implementing usability testing to investigate end user satisfaction. Using cue-summation theory and simplicity theory as theoretical frameworks, this paper presents the main factors and cues required in designing kiosk touch interfaces with the goal to test user performance and satisfaction.

Keywords: kiosk touch screen interface, cue-summation theory, simplicity theory, usability testing.

1 Introduction

A touch screen kiosk provides a user-friendly interface for performing a variety of simple routine functions. For example, it can help visitors find their way around with interactive maps, site photographs, or links to more information. Touch screens are used by people of all ages and educational levels in a wide variety of applications. A well-designed informational touch screen interface can be an effective and efficient method for visitors to obtain information quickly and easily. However, designing touch screen interfaces challenges basic knowledge of human-computer interaction because of the restrictive physical size of the systems, the operating system used on the device and the diversity of users [2].

A building directory touch screen kiosk was selected and tested in this study. The touch screen kiosk is currently in use in a complex building at a Midwestern university. The primary purpose of the kiosk is to provide visitors with directory information and listings of scheduled events. This study examined how the information cues: location, color, text notation and navigation relate to user information selection and processing performance. Using cue-summation theory and simplicity theory as theoretical frameworks, the authors investigated the main factors

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and cues required in designing kiosk touch interfaces with the goal to test user information selection and processing performance. Usability testing was conducted with nine users to test user performance and satisfaction. Additional information was obtained by interviewing the lead designer of the kiosk touch screen interface. This paper discusses the essential findings; limitations and implication of this research on kiosk touch interface design.

2 Background

According to Karvonen [1], both experienced users and novices require the same kind of user interface design to satisfy their needs, that is, a simple design. From a usability perspective, "simplicity" means that users are able to easily obtain what they need. Karvonen [1] further augured that simplicity is also a notion of aesthetic considerations, which affects the user's experience and interpretation of the design.

Cue-summation theory proposes that multiple cues presented both across and within media/channels can improve information processing and learning performance [3]. The usability of any interaction design depends on the relationship between interaction style and input device [4]. Interaction styles represent ways in which the specific input from these devices is translated and used by the computer application such as direct manipulation, command language or menu selection. While a lot of effort is being made towards the development of new input devices and the design of large graphical interfaces, additional research is needed on the design of kiosk touch interfaces to improve user information selection and processing performance.

3 Purpose of Study

This study seeks to understand what design elements and principles are vital in the design. Of particular interest was the determination if color cues, location cues and texture cues impact user performance. Since color and location cues play a significant role in user information processing and selection, the cue-summation theory was applied to categorize main cues of this kiosk touch screen interface. The simplicity principle was the guiding principle in the design of the kiosk touch screen interface and was applied the study to examine how the simplicity attribute contributes to the user's information processing. Selected users interacted with the interface to find information about department events and conduct a lookup in a department directory. This study investigated which design elements and principles were vital during the design process. Additionally, the researchers were interested in determining if color, location, and text cues and simple navigation can impact user performance.

4 Methodology

An empirical study on a kiosk touch screen design was conducted to test how simple navigation and color cue, location cue and text cue would impact user information selection and processing performance. A usability study was performed to evaluate the design of the kiosk touch screen interface. Researchers were interested in determining if users can accomplish common tasks and easily find information using this application and how they perceive the cues and factors while they were implementing the tasks. An interview with the lead designer was conducted to identify what design elements and principles were used during the design of the kiosk touch screen interface.

4.1 Participants

Nine participants identified as potential users of the kiosk touch screen and a lead designer participated in this study. Of the nine participants of the usability study, four were male and five were female with diverse backgrounds and experience. All nine of the participants had prior experience using a touch screen kiosk but none had used the particular touch screen kiosks employed in this study. The lead designer of the kiosk touch screen interface participated in an interview to identify the design elements and principles employed in the development of this touch screen kiosk.

4.2 Data Collection and Analysis

Nine usability tests were conducted using two separate but identical kiosk touch screen devices in situ. During the usability study session, participants were asked to complete four tasks (understand the purpose of the kiosk touch screen; start to use the application; find a designated person; find the schedule of events) by using the kiosk touch screen. As participants completed the tasks, members of the research team observed and took notes. Positive and negative attributes were identified, which impact user information selection and processing performance on the kiosk. After the tasks were completed, the participants were interviewed based on their experience with the touch screen interface. Information obtained during an interview with the lead designer was used to better understand the design choices.

5 Results

5.1 Color Cues

Through the interview with the lead designer it was determined that simplicity was the primary design principle guiding the development of the kiosk touch screen navigation. Color was not a big part of this design process. This did not seem to effect user satisfaction with the interface as six of the nine users indicated that they were satisfied with the color schemes. However, more than half of the participants

complained navigation bar background and navigation buttons was too similar in color and there needed to be greater contrast between the two. One participant commented that gray color of the background body text was unattractive and wanted to see a more color in that area.

5.2 Text Cues

Text cue are important indicators but can sometimes be confusing on touch screen devices. All participants indicated that the text was simple and clear, especially on the touchable buttons. Three participants thought that homepage was too busy making it difficult to distinguish between which areas are touchable and which are not. Eight out of nine participants expressed that the instructions for starting the touch screen were too vague and small with regards to font size. In tasks related to finding events on the kiosk, two participants complained about the timeframe limitation of the events schedule, which only covers one week at a time.

5.3 Location Cues

Location cues can refer to the physical location of the device and the location of button and text within the touch screen. The kiosks were in two visible locations on the first floor of the building. Two participants felt the kiosk would be better served if more centrally located in the floor lobby. Three participants did not initially understand the purpose of the kiosk. Two of the three suggested that signage near the kiosk would assist visitors in understanding the purpose of the kiosk.

5.4 Navigation Cues

Overall, participants found the navigation of the system to be very easy and straightforward with the navigations making sense to them. Two participants pointed out that there was no home or back button on any of the screens. Another participant found it hard to figure out how to start the application. One additional problem found by the participants is the similarity in looks between touchable and not touchable areas on the screen leading to confusion in navigation for some.

6 Discussion

The results of this study provide basic recommendations for designers of touch screen interfaces. Basic navigation improvements for this device include: adding a Home or Back button to each page to ease navigation. Devices need an obvious indicator as to how the device or application should be started. Participants indicated that some of the text and area on the screen looked touchable but some were not. Clear indicators should exist if a particular area on the screen is touchable. Suggestions for color include using a more vibrant colors for the body color and a more distinctive color contrast should exist between the navigation bar and buttons. As more and more

devices incorporate touch screens, it is important that human-computer interface models adjust to assist designers in helping users interact with them more easily and effectively.

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