Objective

We wanted to find out what research had previously been done on information kiosks. We felt that a sound appraisal of the current literature on information kiosks would expose us to the important issues concerning them. This in turn would make us better prepared in formulating our survey, usability test and coming up with recommendations.

We wanted to know about the typical features of an information kiosk, their implementation, design considerations, developments in touch screen displays and interactive maps, and case studies of kiosk usage.

Methods

In order to answer the questions we posed, we referred to proceedings from conferences such as Computer Human Interaction (CHI) and articles from journals related to Human Computer Interaction. Additionally we examined the websites of professional organizations such as the Association of Computing Machinery's Special Interest Group on Computer Human Interaction (http://www.acm.org/sigchi/).

Findings

Slack & Rowley (2002) state that the following forces drive new kiosk design feature sets:

1. Tasks or Functions: Kiosks must provide more interactive and transactional services.
2. Information sources: Web pages and longer pages with more content.
3. Technology: Internet connectivity, email communication, real-time services.
4. User: Users are now typically more comfortable with the look and feel of Web based services.
5. Physical Appearance: No longer consigned to the corner, kiosks must be physically well designed and engaging.

To implement these features in any kiosk located in a highly public, high traffic circulation space, input devices such as alphanumeric keyboards, cursors, and touch screens are needed (Van Kampen, 2001). Alphanumeric keyboards can be standard mechanical, membrane or elastomer-based. While they can be sealed, they are all subject to vandalism by sharp objects. Cursors can be trackballs, pointing sticks or touch pads. Trackballs provide more advantages than the other two since they are more recognizable and usable. However, trackballs can be difficult to mount and use on vertical surfaces. Touch screens can use SAW sensing, capacitive sensing, or resistive sensing. SAW sensing provides high accuracy, capacitive sensing is fast and sensitive, and resistive sensing is scratch resistant. However, water droplets or other objects activate the cursor in SAW sensing, and capacitive and resistive sensing provide lower CRT brightness.

Currently new and improved designs are being implemented for information kiosks. Christian & Avery (2000) compare a "Vision kiosk", which combines machine vision to locate and track people in the vicinity with an animated talking head that focuses on clients and talks to them, to an "Agent kiosk" – a kiosk that uses infrared and sonar sensors to sense clients and multiple interacting on-screen agents to communicate with the client. Their findings are as follows:

1. The quality of the content on the kiosk strongly influences the client's evaluation of the quality of the technology i.e. "Content is King!"
2. People are attracted to an animated face that watches them.
3. Small mobile on screen agents interact better with kiosk content than a single fixed face.
4. Speech recognition has not yet proven to be useful in a kiosk, except in limited circumstances.

In terms of touch screen displays Potter, Weldon & Schneiderman (1988) list some of their advantages and disadvantages. The advantages of touch screens are that they are easy to learn, they save space because no mouse, keyboard etc. is needed and they are durable. The disadvantages are high error rates, imprecision, and fatigue in the arm. To improve upon the disadvantages, the best strategy in choosing an element on the touch screen from a group of elements is to have the curser appear when the user first touches the screen and have it follow the user's touches. When the user likes an element, they remove their finger once their curser is over it.

Sears, Kochavy & Schneiderman (2000) compare different types of touch screens. QWERTY displays the standard keyboard setup onscreen, Alphabetic displays the letters A-Z in order, and Reduced Input Data Entry (RIDE) lists all letters... user clicks... then lists two letter combinations... user clicks... it will keep drilling down until everything can be displayed on one screen. In terms of speed QWERTY comes first followed by RIDE and Alphabetic. In terms of errors, RIDE is the least error prone. The researchers concluded that RIDE is better when there are a limited number of inputs, values are unique, and the values are long.

Landauer & Nachbar (1985) found that both Hick-Hyman and Fitts' laws apply to touch screens and choosing an option from a menu. Their study had subjects choose a goal item from a hierarchy of menu items that were displayed on a touch screen. The reaction times plotted as a function of number of alternatives support both Hick-Hyman and Fitts' law (the size of the target depended on the number and size of targets on the screen). The results also show that it is better to have a shorter menu tree. The subjects were faster at reaching the goal when there were more alternatives per screen and fewer screens to move through rather than fewer alternatives per screen and more screens to move through.

In terms of interactive maps, improvement in speech and pen recognition have developed in parallel with visual display and database access capabilities to yield more broadly functional maps. Sharon Oviatt (1996) in her study found that in comparison with speech-only input to a map, combined use of pen and voice actually was faster, less error-prone, and input involved less complex linguistic expressions to be recognized and parsed. Furthermore, this constellation of performance advantages was matched by a strong user preference to interact multimodally with maps. She states that in large part, the error-prone, slow, disfluent, and generally unacceptable nature of speech-only input to maps can be traced directly to people's difficulty articulating spatially-oriented descriptions.

There have been numerous case studies on innovative kiosk features. The Alamo Kiosk at LAX airport has a credit card slot for transactions. The I + Tourist kiosk in London plays low-volume music when not in use, has an interactive map that guides tourists through directions with landmark photos, and has a small printer for printing maps and directions. The CENTERLINQ kiosk in Beverly Center, LA. has connectivity with commercial services such as printed coupons for stores and applying for an Amex card. It also supports credit card transactions. The BT multiphone at Piccadilly station (Manchester, England) has news, email, internet etc. integrated with phone and the WAMWorld kiosk at Heathrow Airport, London has a keyboard shelf that allows users to place purse, bag, etc. during use. The touch screen kiosk for the Minnesota Landmark Center has an attractive graphical interface, advanced animation, video and audio, a floor-by-floor tour, an updateable calendar of events, directions to the nearest restrooms, and the ability to "virtually" tour any of Center's exhibits. Everland Entertainment’s “Kid City” kiosks have a surface wave touch screen, high quality light transmission, questions with button answers to choose (e.g. "What would you like to hear?" Two pink buttons: "Artists," "Topics"), touchable pictures of artists with their names, individual album graphics and 25 seconds of artists' songs.

Silverstein & Prescott (1998) illustrate a case study where a project involving deployment of kiosks for government services was discontinued. They report that the project, known as the Pennsylvania Kiosk Project, was discontinued because of a dramatic decline in public usage, a loss of enthusiasm among participating agencies, and the emergence of the Internet. Their stated ‘lessons learned’ are not to use a given technology for the sake of using that given technology, conduct a needs assessment at the outset of the project, it is difficult for projects to simultaneously focus on multiple, competing goals, it can be costly and inefficient to implement a kiosk system on a statewide basis, location is critical, functionality is critical, project outreach must be conducted on an ongoing basis, the cost of developing software segments needs to be defined in a manner that is equitable to both contractors and the government entity, and pay attention to emerging technologies.

Looking into case studies on accessibility issues in information kiosks, Vanderheiden & Law (2000) report the use of a hybrid interface for information and transaction touch screen kiosks developed for individuals with low vision and blindness. Two key features were provided: a description of the overall layout of the screen, and a mode where individuals could touch any text on the screen and have it read without activating the button. The approach was found to work well with low vision individuals, but was more difficult for those who were blind, possibly linked to spatial orientation. Techniques developed in this study are now being used in airports, libraries and other community centers.

REFERENCES

Christian, Andrew D. and Brian L. Avery. *Speak Out and Annoy Someone: Experiences with Intelligent Kiosks.* Cambridge Research Laboratory, Compaq Computer Corporation CHI 2000.

Elo TouchSystems, Inc: "Kid City" Kiosks/Everland Entertainment http://www.elotouch.com/markets/casestudies/kidcity.asp

KDG Interactive: Minnesota Landmark Center. http://www.kdg.com/products/casestudies/mic.shtml

Landauer, T.K. and D.W. Nachbar. *Selection from Alphabetic and Numeric Menu Trees Using A Touch Screen: Breadth, Depth, and Width.* CHI 1985.

Oviatt, Sharon. *Multimodal interfaces for dynamic interactive maps. Conference proceedings on Human factors in computing systems*. 1996.

Potter, Richard L., Linda J. Weldon, and Ben Schneiderman. *Improving the Accuracy of Touch Screens: An Experimental Evaluation of Three Strategies*. CHI 1988.

Sears, Andrew, Yoram Kochavy, and Ben Schneiderman. *Touch-screen Field Specification for Public Access Database Queries: Let your fingers do the walking*. ACM 1990.

Silverstein, Gary and Debra Prescott. *Evaluation of the Telecommunications and Information Infrastructure Assistance Program*. March 1998.

Slack, Frances & Rowley, Jennifer. *Kiosks 21: a new role for information kiosks?* International Journal of Information Management 22 (2002). 67-83.

Vanderheiden, Gregg and Chris Law. *Ergonomics of a non-visual touch-screen interface: A case study*. http://www.trace.wisc.edu/docs/touch-screen_ergonomics2000/ergonomics.htm Trace R&D Center, University of Wisconsin-Madison.

Van Kampen, Kurtis J. *The Interface Between Humans and Interactive Kiosks.* Educational White Paper by Input Technologies, LLC.