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# Understanding Accessibility of Self-service Kiosks for Users Who Are Blind

**Gabe Vespasiano**  
DePaul University  
243 S Wabash  
Chicago, IL 60604 USA  
gvespasi@depaul.edu

**Arturo Amaya**  
DePaul University  
243 S Wabash  
Chicago, IL 60604 USA  
aamaya1@depaul.edu

**Lina Moon**  
DePaul University  
243 S Wabash  
Chicago, IL 60604 USA  
lmoo1@depaul.edu

**Joey Reyes**  
DePaul University  
243 S Wabash  
Chicago, IL 60604 USA  
jreyes51@depaul.edu

**Ashley Loomis**  
DePaul University  
243 S Wabash  
Chicago, IL 60614 USA  
aloomis1@mail.depaul.edu

**Matthew Homco**  
DePaul University  
243 S Wabash  
Chicago, IL 60614 USA

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## Abstract

Self-service kiosks are available in a wide variety of forms, such as ATMs, store check-outs, airport check-in stations and fast food menus. With kiosks popping up in more locations, it's important that they are accessible to those who are blind. In this study, we sought to understand the experiences of people who are blind while using kiosks. We conducted four interviews with participants to

understand their perspectives. We organized findings into the following themes: familiarity, interface, privacy/security, and assistance. Our research found that blind users are most often faced with navigation issues, inconsistent interface designs, and lack of auditory and sensory feedback.

### **Author Keywords**

Accessibility; Human-Computer Interaction; Blind; Kiosks; Interviews; Self-Service

### **ACM Classification Keywords**

K.4.2 Computers and Society: Social Issues (Handicapped persons/special needs); H.5.2 User Interfaces (Auditory feedback/Input devices and strategies/Interaction styles/Screen design/Standardization/Voice I/O)

### **Introduction**

Touchscreen kiosks are increasingly common in the US. From self-checkout stations at grocery stores to ATMs and check-in stations at airports, self-service kiosks have become a default or a requirement in many public contexts [7]. While these kiosks are convenient for people in many ways, they can also be challenging to use for those who have blindness or are visually impaired as they are often not designed for accessibility.

There are four major problems people who are blind encounter with touchscreen kiosks. First, they can find it difficult to locate kiosks if there are no human guides to assist them [3]. Second, they may not be able to interact with the kiosk at all if it is just a touchscreen with no audio option. Third, while some kiosks may have options for audio and the ability to use headphones, there can be issues with environmental noise and safety from decreased awareness of one's surroundings [2]. Privacy is also a major concern with audio. If a person who is blind asks for assistance while

using an ATM, they open themselves up to the risk of revealing their personal information or theft [6].

There have been efforts to make kiosks more accessible through a set of unified guidelines for kiosk vendors. Lazar, et al. have found that while there is no one universally agreed upon accessibility standard for kiosks, there have been independent efforts from public and private sources [5]. Related, Veijalainen has also discussed guidelines for those who are visually impaired [9]. However, these have primarily been compilations of existing standards rather than studies hearing directly from users.

Many authors have also explored different concepts focusing on improvement on a specific aspect of a certain type of kiosk. For example, Duerstock, et al. have experimented with universal keypads for some kiosks, most notably ATMs [1]. The authors also examined the possibility of using smartphones alongside kiosks to sidestep accessibility issues. In a study examining audio input, Day, et al. investigated attitudes to using wireless audio headphones among those who are blind [2]. Some researchers have also explored additions to touchscreen and modifications to touchscreen interactions.

In an example of modifications, Sandnes, et al. explored using hand gestures to navigate kiosks as opposed to physical touch interactions [8]. The authors found that simple strokes on a touchscreen allowed users who were blind to successfully complete a ticket purchase. In an example of additions, Jokisuu, et al. explored adding tactical markers alongside screens to input personal information [4].

In our study, we aimed to understand the personal experiences of people using different types of kiosks to identify the current landscape of kiosk accessibility. We focused on analyzing common themes from using these

kiosks and defining implications for design from these experiences.

In the following sections, we present our methods, findings and discuss the implications of our findings.

## Methods

### *Participants*

We interviewed 4 participants who 1) were at least 18 years of age, 2) self-identified as blind or low-vision, and 3) had used a self-service kiosk before, e.g., an ATM, grocery checkout, food service, or other type of kiosk. We recruited through help from our advisor, Cynthia Putnam.

Participant	Age	Gender	Location
Barb	52	F	Chicago, IL
Maura	28	F	College Station, TX
Sarah	34	F	Chicago, IL
Taylor	67	F	Chicago, IL

**Table 1:** Participant Demographics

### *Data Collection*

We interviewed participants remotely through video calls. We started our interviews by asking participants what types of touchscreen kiosks they had used before. We then asked them to describe their experiences with kiosks that were easy to use and difficult to use. We also inquired how they felt about certain features (e.g. audio headphone jacks) and processes such as making changes on an order or making payments. Similarly, we then asked how the participants felt about privacy and security while using a kiosk and receiving assistance.

We wrapped up the interview by asking interviewees what improvements they thought could be made to the

touchscreen kiosks they used, and any additional experiences that they wished to share. We recorded each session and took notes.

### *Data Analysis*

We transcribed audio from the interviews using Temi. Next, we highlighted important quotes from our interview transcriptions and added them to a Mural board as sticky notes.

Using Mural, we initially organized our interview quotes into separate affinity diagrams by participants. We then discussed our findings and created a second affinity diagram using all the interview quotes together to pull out major themes and pain points.

## Findings

From our interviews, we identified the following themes related to kiosk usage for people who are blind or visually impaired: (1) Kiosk Familiarity, (2) Kiosk Interface, (3) Privacy and Security, (4) Assistance.

### *Kiosk Familiarity*

We found that the physical layouts of self-service kiosks are key to their accessibility. All four interviewees mentioned that they had an issue understanding where controls or specific features were on the device. When someone couldn't find a key feature on the kiosk, it led to frustration that occasionally led to incorrect orders on a fast-food kiosk or fumbling for money at ATMs. One user worried; "I heard the machine saying, please grab your cash. But I was frantically searching for the cash dispenser."

We found that user familiarity with the kiosks was essential for how confidently they could be operated by blind and low vision users. All four users expressed that their previous usage with a particular kiosk was helpful for them understanding their physical layouts. Three users stated that they were unable to find features they

were looking for on devices they were unfamiliar with. One interviewee described an encounter with an unfamiliar ATM: "the layout of the ATM was slightly different than what I like the ATM here at my regular bank." It seems that inconsistencies between layouts of kiosks between stores makes them more frustrating for this group of users.

We also noticed that accessibility features will often go unnoticed by blind or low vision users because they won't know that they are present. Three out of four interviewees stated that they had trouble finding or using accessible accommodations on kiosks. Even when ADA controls were included in the kiosk design, they weren't always noticed by our interviewees. One interviewee described how in one instance, a feature was lower than expected on the kiosk she was using: "[After ordering, I found the controls] below the keypad, like where you insert your card. So I didn't know to look for the buttons at wheelchair height."

Locating a self-service kiosk within an unfamiliar space seems to be a common challenge for users with blindness or low vision. Three of our interviewees expressed frustration with finding kiosks within stores. These three all mentioned that they would try to rely on their understanding of the store to find them, but oftentimes their locations varied between stores. One interviewee told us; "The location of a kiosk isn't always consistent. Even if you do know ... that such a kiosk exists, you might not necessarily know where it is." Larger spaces seemed more prone to have this issue with one interviewee mentioning airports as a particularly challenging space to locate a kiosk.

Our one interviewee that was able to see but had low vision said that finding kiosks was easy, but much like in our other interviews, she did rely on previous experience to know where to find them. Generally, she

would go to the front of the store and look for the lights of their screens.

#### *Kiosk Interface*

Two out of four interviewees reported that kiosks with a touch-only interface were completely inaccessible due to entirely visual feedback. One user required that a kiosk had tactile controls before even attempting to interact with the device. Two interviewees stated that haptic feedback such as vibration may assist in interface navigation as well. Tactile controls allow for physical feedback to guide the user through a process.

It was often mentioned that some kiosks feature audio guidance as another form of feedback. All interviewees experienced an increased level of comfort using a kiosk that had audio feedback, but one user was uncomfortable with the idea of using public headphones. One interviewee mentioned that audio was most helpful when the feedback was descriptive, as opposed to single tones or beeps.

Three out of four interviewees mentioned that they experienced issues with correcting an error or making a change with an order. Three users stated that they were frustrated when trying to either change a previous step or correct their mistakes. One user in particular was frustrated that sometimes the only way for her to confidently correct the error was to completely start over. "So I'll have to start from scratch again, inserting the card and putting in my pin, you know? So it's just time consuming".

One user did mention that they appreciate when the kiosk, in this instance an ATM, will ask them to confirm key decisions before submitting them. They believed that this was a helpful feature that helped to prevent errors.

Our one interviewee with low vision found that kiosk contrast was often too low, and that text was often too small. Another interviewee reported that she bypassed most kiosks with Apple Pay, which allowed her to simply use her phone to perform a transaction. When faced with many accessibility barriers at kiosks, most users found themselves asking for assistance from others.

#### *Privacy and Security*

All the interviewees mentioned privacy and security concerns while interacting with a kiosk. Entering personal information is a cause of discomfort when using a kiosk, and this may be amplified when entering such information in a public space. One interviewee stated "when you're having to put in a credit card and you have to get help with that sort of thing, I don't feel comfortable doing that with people." Another participant would not enter sensitive information in a public space due to the security concerns they had during the interaction.

A second participant stated that using headphones helped with feeling secure as people around can not hear the interaction. Other participants mentioned bringing a trusted person with them to conduct a transaction at an ATM in order to not make it an uncomfortable situation.

#### *Assistance*

We found that all of the participants mentioned that they will often bring a trusted person (e.g., friend or family member) to kiosks to assist them if they know in advance the kiosk is not accessible. One interviewee described how her mother had to help her at grocery self-checkouts: "[My mother] had to use it for me because even though it had those basic audio prompts, I really wouldn't have known what to press." However, we found that even in cases where they are able to use the kiosk independently, some individuals will have someone accompany them to speed up the process.

Time and convenience was also a factor in another person's decision to go to a cashier instead using a grocery self-checkout with assistance: "I could ask for store assistance to use the self checkout, but essentially it might take just about the same time as it would take for me to just stand in line and wait for the cashier." Like anyone else, individuals who are blind prefer to use methods that save them time and effort when they are out and about.

When they are not with someone they already know, we found that participants generally feel comfortable asking for help from staff or employees when using a kiosk. One person said that in a store, "because I've used cashiers for so long and that's always been the option, I don't think twice about that." Another person shared the same sentiment, saying "I trust that that cashier is giving me the right information, telling me the right thing to do."

Even in situations in which they were primarily interacting with a person, however, participants found that there were times that they still needed to interact with a kiosk. One person described how at the grocery store, the cashier would scan groceries for them but when paying for the items they would need to interact with the credit card machine and "verify where the OK button is."

## **Discussion**

### *Kiosk Familiarity*

One of the most often cited pain points from our interviewees was difficulty finding features on the kiosks. All of our interviewees stated that they were frustrated while trying to understand a kiosk's layout. Accessibility features such as ADA controls or even core features such as the cash dispenser proved challenging

to find because of design inconsistency. Furthermore, with three out of the four of our interviewees stating that they had difficulty finding inconsistently placed kiosks, we believe both location and layout consistency are key accessibility issues.

One thing we noticed that helped people both locate, and comprehend the layout of a kiosk was their familiarity from previous usage. Although it may be difficult for different kiosk owners to collaborate or agree on the design of their kiosks, consistency in design and store location between kiosks would greatly improve their accessibility. We believe a set of design guidelines for all self service kiosk layouts could greatly improve their ease of use for blind or visually impaired users.

#### *Kiosk Interface*

Our interviewees reported to us about several interactions that they've had with self-service kiosks. It was found that several kiosks these interviewees used were touchscreens. The most concerning aspect of a touchscreen interface is that interaction requires an understanding of the visual placement of each button. Touchscreens created a barrier of accessibility for blind and vision-impaired users for this reason alone. One possible form of alternative feedback is auditory. These sounds may come in the form of audio narration or a simple series of beeps. It can be inferred that verbal guidance will assist in navigating a kiosk's interface considerably. Audio feedback and guidance is at least perceptible by blind and vision-impaired users, allowing for better usability.

Usually, when our interviewees found themselves in need of navigating to previous pages or forms at a kiosk, they ran into an issue or frustration. It can then be inferred that error correction within kiosks requires further attention. For example, one user told us that kiosks asking for confirmation before proceeding to a new page was a helpful amendment to this issue. Our

participants also reported bypassing kiosks as a whole due to some of these issues. Several instances of asking for staff or friend assistance were reported, and it can be inferred that this is always a possible solution outside of kiosks themselves.

#### *Privacy and Security*

Interactions at kiosks created privacy and security concerns for most of our participants. Three main concerns of our participants were physical theft, information theft, and verification of signatures. In order to mitigate the concerns, three possible solutions are: (1) Placing kiosks inside organization spaces such as inside a bank, (2) bringing a trusted person for the interaction, or (3) using headphones to eliminate the chance of an outside party listening. These three solutions all decrease the chances of an outside party directly intruding during the interaction, which leads to the possibility of that being the overlapping problem between all three concerns.

These three solutions may be developed into guidelines for all kiosk interactions, which will greatly improve the privacy and security of interactions for visually impaired users. For example, all kiosks should be placed within the organization's building, a staff member should be required to assist during an interaction if requested, and earphones should be available if requested as well.

#### *Kiosk Assistance*

We found that participants brought a trusted person with them when they knew a kiosk was not accessible, but also learned that they occasionally preferred someone with them when they wanted the interaction to go faster. In addition to creating kiosks that are more accessible, kiosk accessibility should also consider the speed at which people who are blind would prefer to interact with kiosks (e.g. skipping audio tours, increasing the speed of audio).

All of the participants described receiving help from staff or employees at least once. While their experience receiving help from employees was not negative, we feel that the frequency of these interactions indicate the importance of employees receiving training on how to assist individuals who are blind. We found that participants were impressed when the employee was knowledgeable about accessibility accommodations.

Finally, we found that participants often interacted with smaller devices such as credit card machines and Square readers even when interacting with a person face-to-face. While they were assisted by employees in these instances, we feel that accessibility accommodations also need to account for these types of devices even if they may not be typically what people picture as a kiosk. Similar to other kiosks, these accommodations may include audio guidance, tactile buttons, etc.

### **Limitations and Future Studies**

Conducting our study remotely was somewhat limiting on the data we were able to collect, which in turn shifted the scope of our findings. Our interview data is limited to what the participant can recall, and relies on our questions that we wrote without observing this interaction ourselves. As sighted researchers, our inquiries may miss key usability issues that blind and low vision users have. We also conducted four interviews and would most likely need more data to make more significant conclusions.

We think our study is a great jumping off point for future accessibility evaluations. Future studies would ideally involve observation of a larger number of participants ordering from various kiosks along with interviews. This could give us greater insights into how successfully this set of users is able to work with the

kiosk and could help us further understand how our participants could more easily use these devices.

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