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Ikea Store Navigator

An augmented reality assistant for navigating Ikea stores

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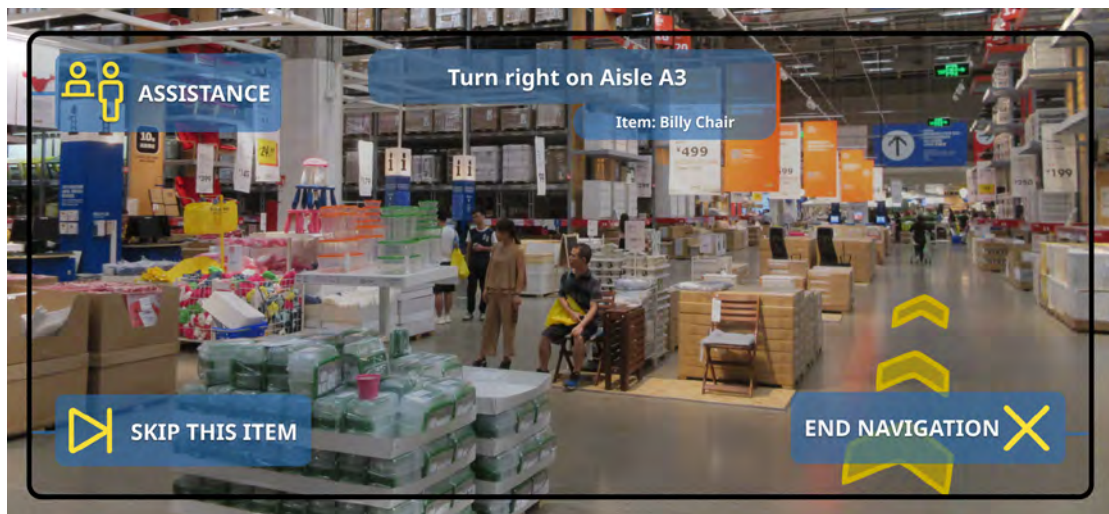
Introduction

Abstract

The Ikea Store Navigator is an Augmented Reality (AR) application that helps its users navigate Ikea stores. Ikea stores are famous for being labyrinthian in their size and difficulty to navigate. To resolve that issue, the application allows users with AR headsets, provided by the company, to identify products they want to purchase, then lead them to the specific location of the items in the warehouse section of the store.

The application works by scanning the tags of the products intended for purchase on the display floor, and then provides the user with a google maps style navigation through the warehouse to get users to all of the items they will buy in the shortest amount of time possible.

This application is different because there isn't a lot of development in the market for in-store navigation, and Ikea still uses a pen and paper system for its customers to find the furniture they want. Alternatively, users have moved towards taking pictures of the tags, but this can be alleviated with the application itself.



Schedule

Week 1: Brainstorm and develop initial product concept

Week 2: Draft abstract and define audience

Week 3: Plan interviews for research and competitive analysis

Week 4: Complete interviews and document responses to create a user persona

Week 5: Create a user story with common user scenario and sketch UI

Week 6: Wireframing for key path scenarios and important validation scenarios, as well as a usability analysis test

Week 7: Analyze results of usability test and update wireframe, complete high fidelity wireframe

Week 8: Review feedback on high fidelity wireframes, identify any ethical concerns in regards to the product and its use

Week 9: Explain what technological advancements the application is reliant on, consider future updates to the design

Week 10: Brief summary for each element of design in the application, finalize the application screens, begin drafting final report

Audience

Our audience is comprised of anyone who is in the market to buy furniture or home products, but is either frustrated by or in need of assistance navigating the store. This rings doubly so for people who like Ikea products but are deterred by the length of time they might need to spend if they only need one or two things.

Technical requirements

This application uses AR glasses with four buttons and a camera on it, and would need to be a lightweight, portable unit that isn't plugged into a secondary module like some industrial AR sets are. This will make the device much easier to handle as a

user. The battery life would also have to be on the longer side, as customers can be expected to spend many hours in the store. The application also requires a wireless connection that would allow the device to determine its position within the store. This would require the store to be set up with either NFC or Bluetooth transmitters to help the device navigate itself around the store.

Possible constraints

The application focuses on the user's needs and how they can improve their shopping experience. Some constraints can come with AR glasses. On most current AR glasses the battery life isn't very long and especially since the length of time a customer would be shopping is unknown, the battery life ought to be at least as long as the typical Ikea shopping experience. Ikea would initially have to invest in the glasses, which could be a considerable amount of money that they would have to be willing to pay. Also, they would have to set up wireless devices throughout their store because the glasses use a navigation system. Another drawback is the likelihood of the glasses being heavy. With the buttons on the sides of the glasses and the camera, it could potentially be irritatingly heavy or cause other issues for the user. To allow every interested person to use these glasses, we would have to accommodate for individuals with disabilities which will be discussed further in ethical considerations and future enhancements.

Competitive landscape

Existing alternatives

Solos Smart Glasses: This product is meant for cyclists to use while they are bike riding. The technology is intended to navigate their route and connects to fitness apps. The downside of these smart glasses is their short battery life.



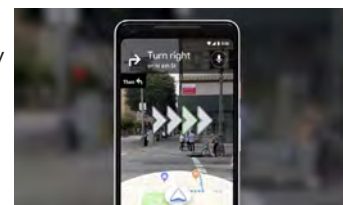
MapsIndoors: This program is an indoor navigation app that does not use AR technology but does help the user navigate indoors through their phone. It is based on Google Maps and works similarly to how it does in the outdoor setting. This technology can be interfaced with whichever system works best for the building such as WiFi, bluetooth, magnetic fields, or others.



Lowe's Innovation Labs: Lowe's Pioneered an AR navigation application in a partnership with Google. You would inform the app of items you would like to purchase, and the phone would point you to the exact location of the item as it gave you turn by turn instructions.



Google Maps: Google seems to have taken AR navigation technology the furthest. Right now there is augmented reality technology in their app that users can turn on in supported areas. The user holds up their phone and large arrows and directions tell the user where to go by sensing where they currently are.



Similar form factors

Vuzix Blade: Can be used for GPS if used in conjunction with your phone, but users report experiencing fatigue after wearing the device for a short amount of time. Significantly less expensive compared to the Dynaedge AR-100. Cannot be adapted to users with prescription lenses.



Toshiba Dynaedge-AR100: More than capable device for store navigation that doesn't need a phone, but requires a heavy attachment. Also very expensive due to their use in enterprise. Can be fitted to prescription glasses.



Ikea Place: Augmented Reality app from Ikea that allows users to preview what their products would look like when placed in their homes before they buy. Signifies Ikea's prior experience in the field of AR.

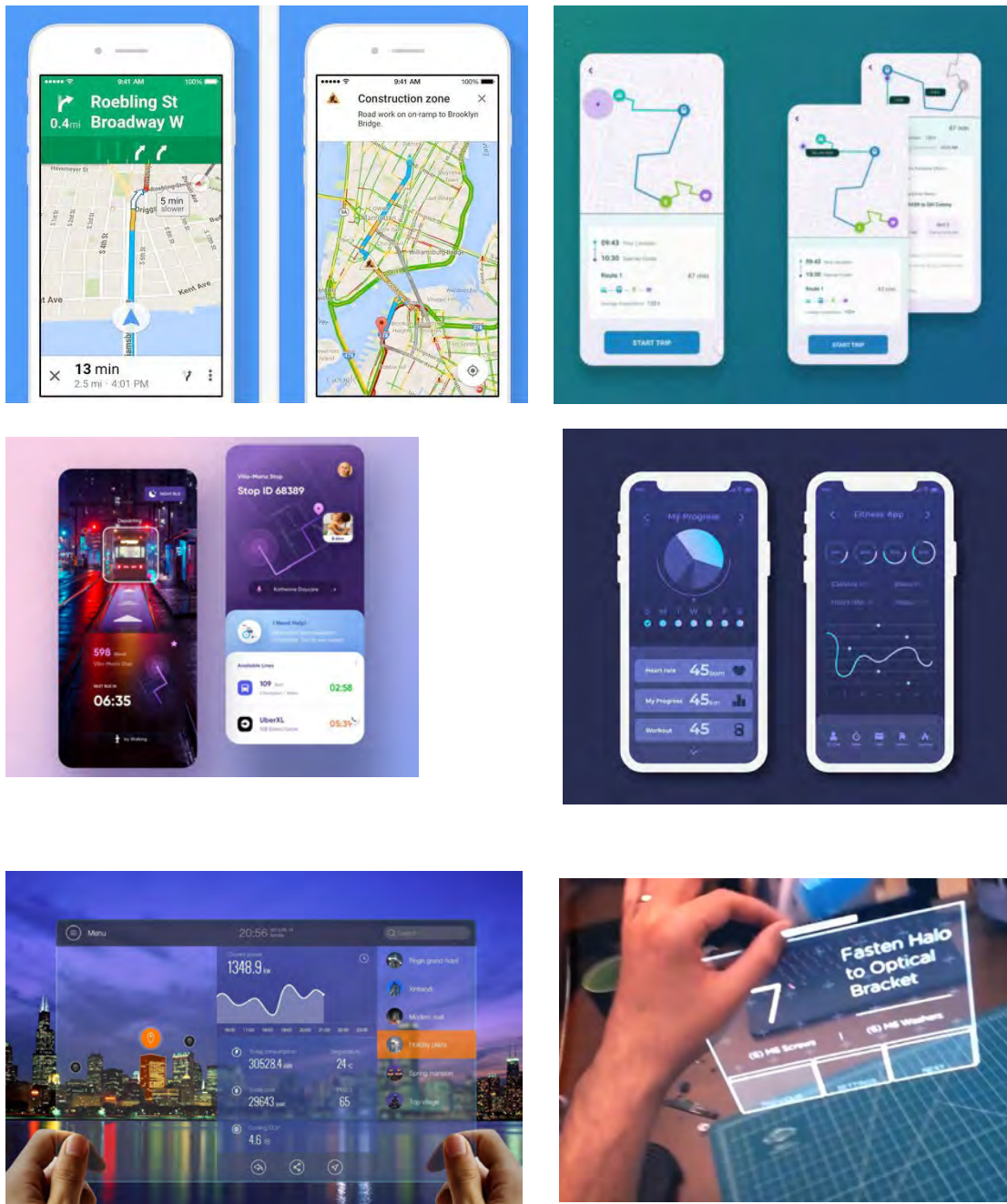


Pokemon GO: Augmented Reality mobile game. You have the ability to move around and catch Pokemon. The map on the left will show your avatar moving each time you move in real time. With the image on the right you can actually see what your surroundings look like and a Pokemon will appear. The downside of using the app is it depletes your battery life really quickly.



Visual language references

App interfaces and AR we like.



Research

Research questions

The objectives of our interview are to find out what peoples current experiences shopping at Ikea and discovering the pain points so we can design our product to aid them. Additionally, to gauge how comfortable they are with navigation technology and Augmented Reality.

Have you ever shopped at an Ikea? When you visit Ikea what is the shopping experience like? Walk us through the steps of making a purchase at Ikea.

What do you struggle with the most when you are shopping in large stores such as Costco or Ikea?

How confident do you feel in navigating large stores or shopping malls?

What are you usually looking to do (goals) when you are at a furniture store?

How do you usually feel when you are shopping at a large furniture store? What is your mood? What emotions are you experiencing?

What factors make a good shopping experience in your opinion? What makes a bad shopping experience?

What are the things that convince you to purchase something or not at a furniture store?

Have you ever heard of or used an Augmented Reality headset? How do you perceive this technology?

How comfortable are you using navigation services on your phone?

Findings from the research

Karen - 53, management analyst

- » Mother of two, busy work schedule, spends lots of time shopping each week
- » Feels overwhelmed in Ikea - maze like
- » Always finds what looking for online before going to store
- » Just wants to find what looking for and get out
- » Wants some help with navigating store from employees but doesn't want them to hover
- » Concerned about AR technology making her nauseous

Corinna - 20, college student

- » Overwhelmed in Ikea by the size and amount of stuff
- » Feels optimistic at beginning and then worn down and wants to leave the longer she spends time there
- » Browses for a long time whether or not she wants to

Sasha - 20, college student

- » Goes for the browsing experience
- » Feels overwhelmed by size of store
- » Feels trapped in store - no exits and little natural light
- » Wishes she didn't have to wander so much to get to the next section or the exit

Marie - 47, Stay-at-home Mother

- » Stores can often feel like a maze, I don't like to wander in them
- » The hardest part of navigating big stores is when things aren't labeled
- » Would prefer to be left alone, with quick service
- » Doesn't always go to Ikea looking for furniture
- » Doesn't like AR, but thinks the idea of a navigation assistant would be useful to others

Rihannon - 22, Software Developer

- » Hard to navigate Ikea and other big stores, it often feels like you have to guess at where things are, would like to know what sections contain what items.
- » Would like to know what items are in a given section of a big store like Costco
- » Practicality is the most important. They just want to get what they need and leave, not linger.
- » Labels, navigation, and assistance are all key parts to a good shopping experience
- » AR is a cool technology but unsure how practical it would be in a store.
- » Human assistance should still be a part of the customer's experience

Grace - 25, Physical Therapist

- » Shopping at Ikea is basically an adult Disneyland to furnish your house.
- » Quite overwhelming
- » Struggles with the close confinement even though Ikea is such a large store
- » Usually knows where to go in the store
- » Feels better when stores are organized

» The design and appearances definitely help in whether to buy a certain product

» Feels comfortable using navigation on their phone

Morgan - 19, College Student

» Struggles with not knowing where to start in a store

» If there is a map then it's easier to know where to go

» Customer service is key

» If an employee is helping with the purchase then they feel more comfortable to buy

User interaction design

Persona

Susan Cooper, 32 years old



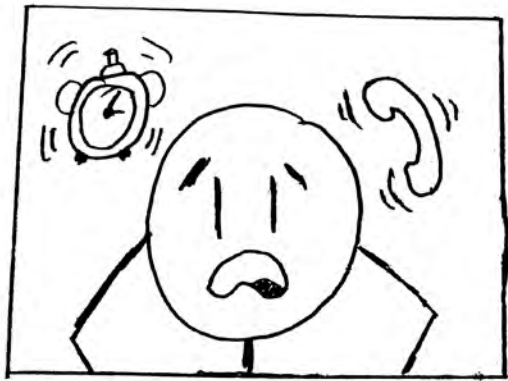
I feel lost whenever I go into Ikea. I wish there was a way to navigate quickly through the store without distractions, so I could get on with my busy day.

Susan is a training manager for a financial company. She recently moved to the Bay Area and is looking for furniture for her new home. Her job is relatively busy, so when shopping for furniture she would like a smooth and quick process. While she doesn't mind human assistance from time to time, she'd rather just get things done on her own. While Susan isn't very familiar with AR technology, she's very open minded and is already pretty used to using navigation services on her phone. The way that Susan buys furniture at Ikea involves her taking pictures of all the tags for things she is interested in, then wandering around the warehouse to pick them up. It's very slow and frustrating as it's not organized well on her phone and she finds herself lost or backtracking a lot in the warehouse section of the store.

Goals

- » Acquire the furniture she's been planning to buy.
- » Speed up the shopping experience at the warehouse
- » Get assistance on demand, from a person if it's easier

Scenario



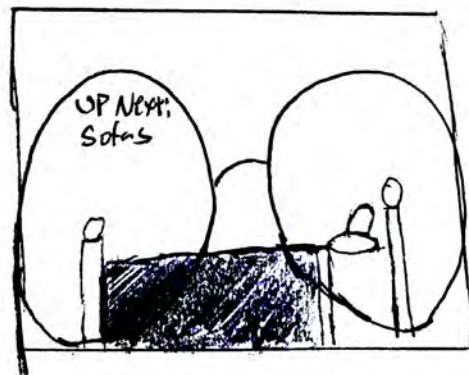
Susan Cooper has a very busy day today and is still not finished moving into her new place. On her to-do list: get a sofa for when she has guests over.



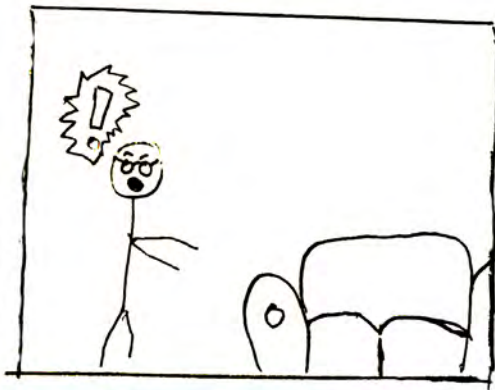
Susan goes to Ikea, it's a busy Saturday afternoon. She is in desperate need of a sofa for her new apartment. She is specifically looking for a couch she found online.



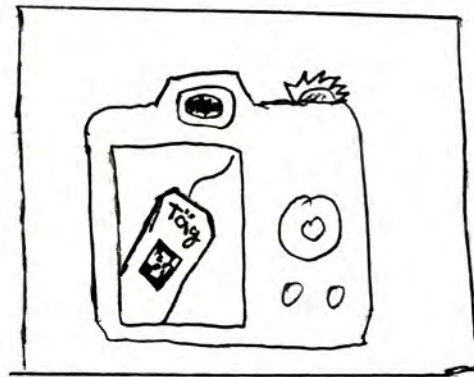
She goes up to the kiosk and picks up one of the navigation headsets that they provide.



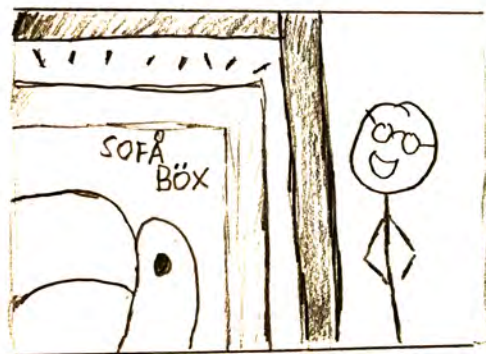
She starts to wander through the store trying to find the couch section. Her headset notifies her which section she is currently in, so she knows she is getting close when it notifies her that she is about to enter the section with the sofas.



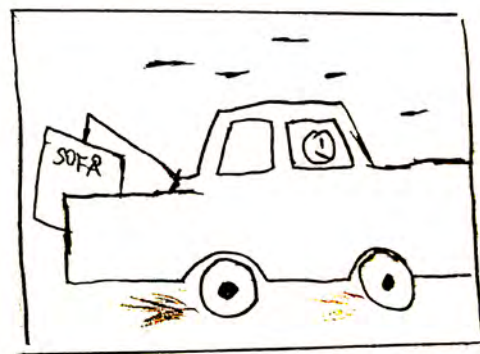
She sees a sofa in the style she likes but not the color, so she hits the button on her headset to call for assistance. Even though there wasn't an associate nearby, they came to assist her quite soon after she called for them.



With the assistance of the associate, she finds the sofa she wants and scans the tag using the built in camera on the headset. The headset will store this data for when she gets to the warehouse to pick up the sofa at the end of her shopping trip.



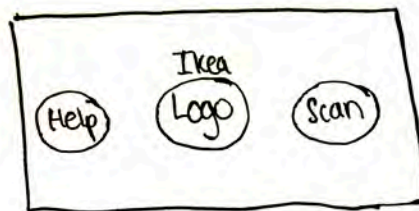
She finds her way to the warehouse, assisted by the headset. Once she gets there, the headset navigates her to the exact location of the sofa. This saves her quite a bit of time over the older method of finding furniture.



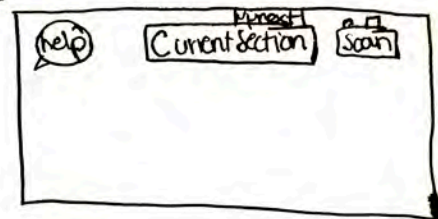
Susan leaves with her couch, thrilled that this took much less time than she expected. Her guests now have a place to sit, just in time for her dinner party.

Interaction framework

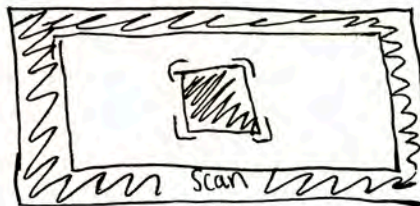
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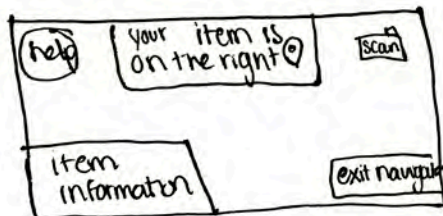
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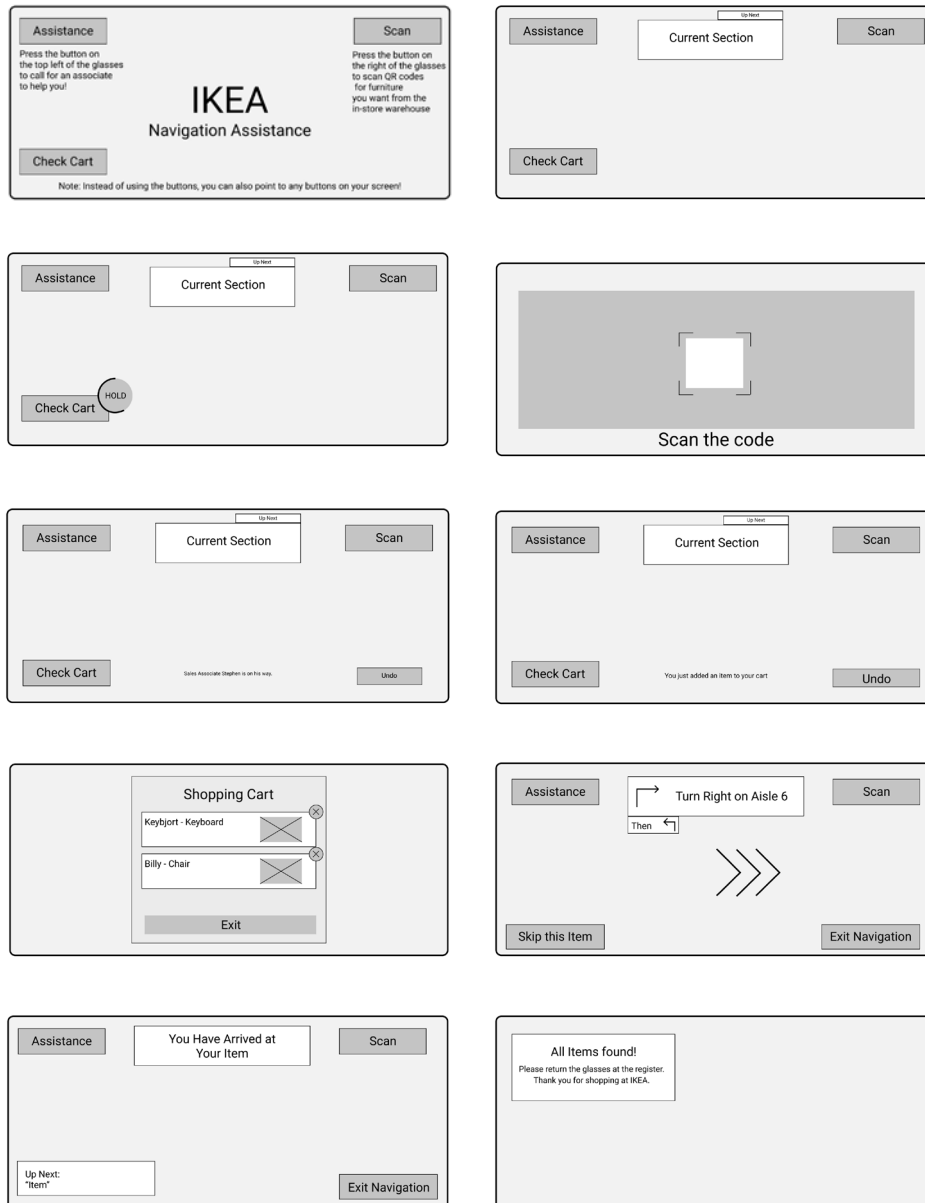
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Wireframes



Usability analysis

Usability analysis tests

Tasks:

- » Scan a piece of furniture.
- » Call for assistance.
- » Undo the call for assistance after calling.
- » Check what is in your shopping cart.
- » Delete something in your shopping cart.
- » You have arrived at the warehouse section of the store, follow the instructions to reach your item.
- » You don't want an item anymore so you don't need directions, try to skip to navigate to the next item.
- » You have found the items you want, exit the navigation.

Usability analysis results

Scott Irwin

- » Found the user interface to be mostly intuitive, minor nitpicks about the product itself not relevant to usability.

Rae Salceda

- » Change the button from "cancel" to "undo", wasn't sure how to initially undo calls for assistance
- » Buttons are obstructive, need size adjustment
- » Status text was too small

Corinna Donovan

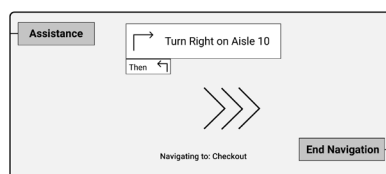
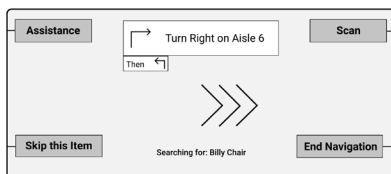
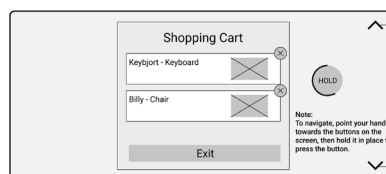
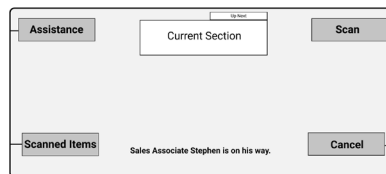
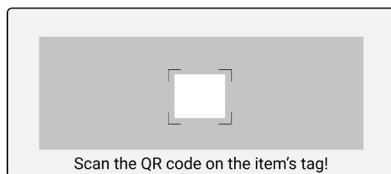
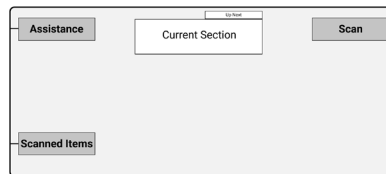
- » Navigation not 100% clarified, does this only navigate in the warehouse or can it do more?
- » Was a bit confused about the navigation visuals the arrows were confusing but possible that it was just due to the arrows having no context in the wireframe (the arrows would run along the floor to navigate users in the actual visuals)

Sasha Braginsky

- » Thought everything was clear and straightforward
- » Confused by the current section/next section of the store, without context. This may have also been due to the wireframe format. Would likely have been alright in real life, so long as context is given as to where they are in the store.

Changes from the results of usability analysis

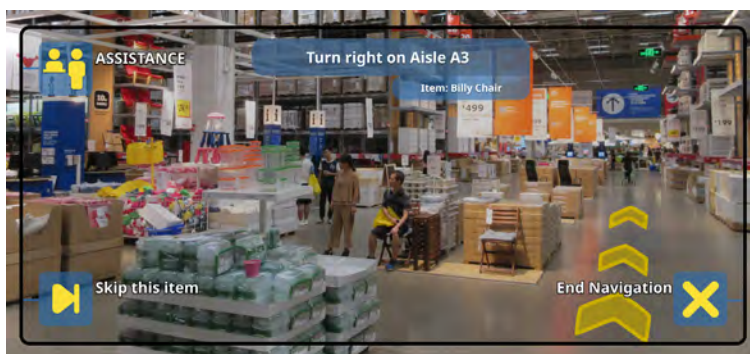
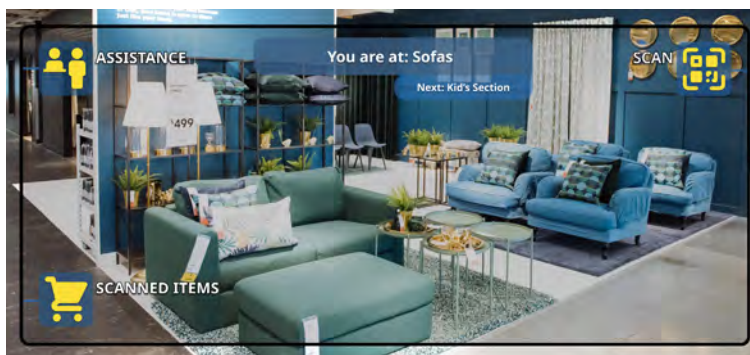
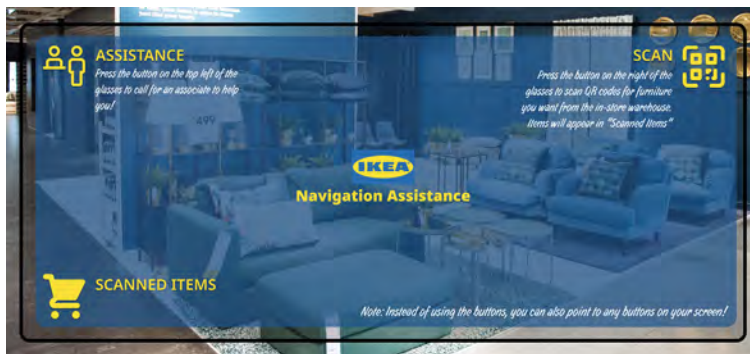
Based on the feedback from our usability analysis, we made changes to our previous wireframes. In the first screenshot, we made the text bold on the buttons and made it clear where to scan when using the QR code. In our second screenshot, we deleted a wireframe and added in a new one. Our last wireframe guides the individual to the checkout counter, where they then can drop off their glasses. We also clarified the buttons in the shopping cart. There were also suggestions about changing undo to cancel and exit navigation to finish navigation. So we made those little changes as well. On the navigation screen we explained what item they are searching for.



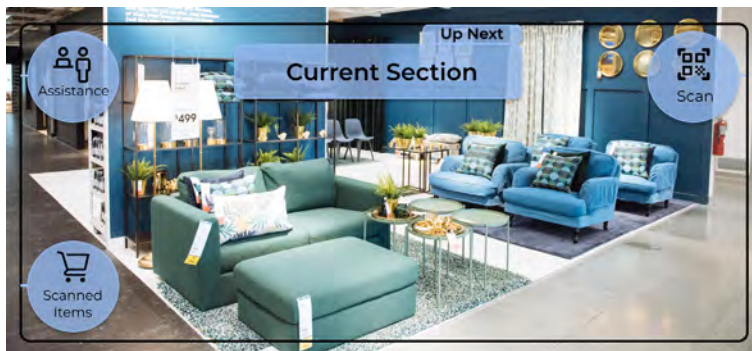
User interface design

Annotated layouts

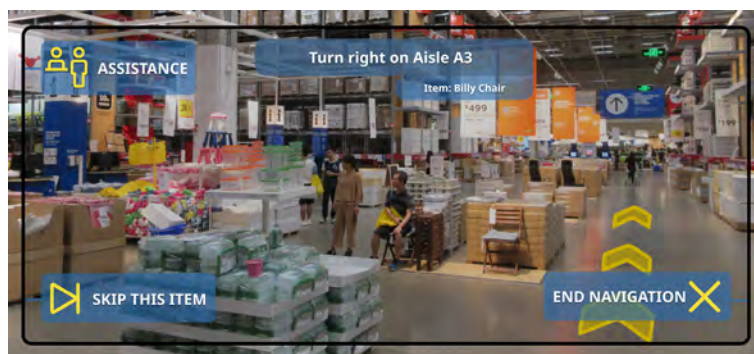
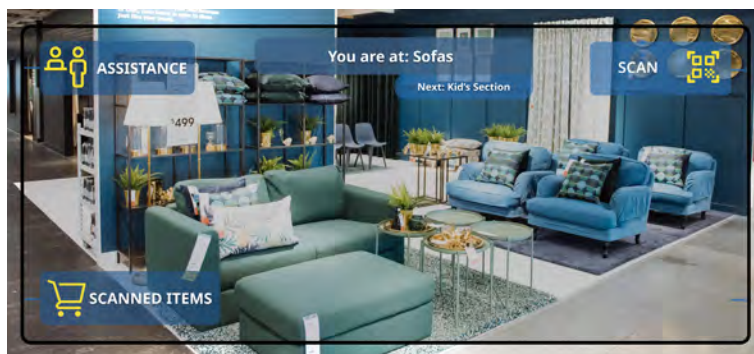
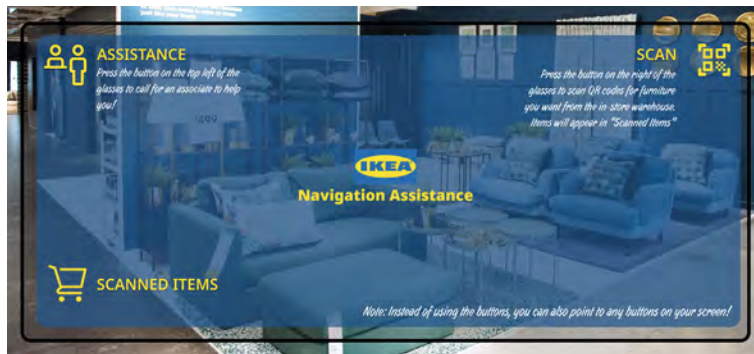
For our first layout we went with the color scheme from Ikea. Our buttons have round edges with yellow icons. There is transparency on the buttons so the user can still be aware of what they are seeing through the glasses. The font we used is Noto Sans.



On Layout 2, our buttons are circular instead of rounded squares. Instead of yellow, all text and icons are black. The transparency of the buttons is the same as in Layout 1. This layout uses the font Montserrat.

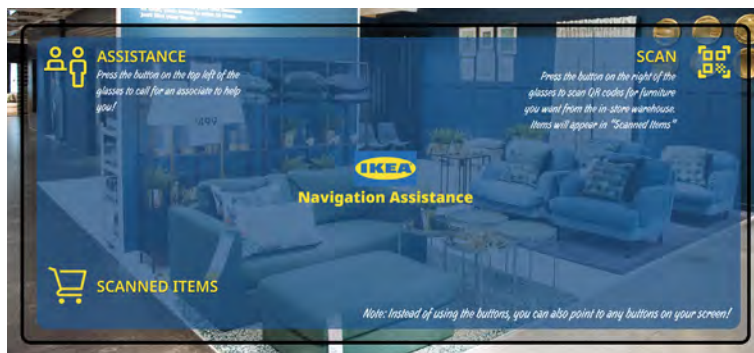


Layout 3 was mostly a reiteration upon the first layout, with refinements made to make the design more visible. The visibility of the text and icons still utilizes depth and transparency layers, which allows the user the ability to clearly see the interface without the elements completely blocking the user's vision. The buttons in the corners of the interface of the glasses represent the four physical buttons on the sides of the glasses, two on each side. The small lines going off of the rectangular buttons on the screen indicate to the user to press the physical buttons on the glasses.

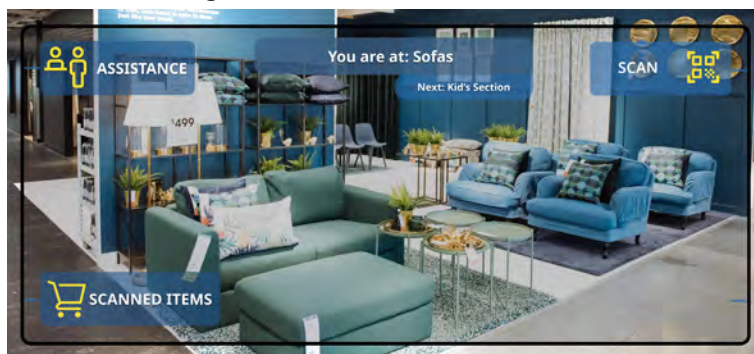


Final product

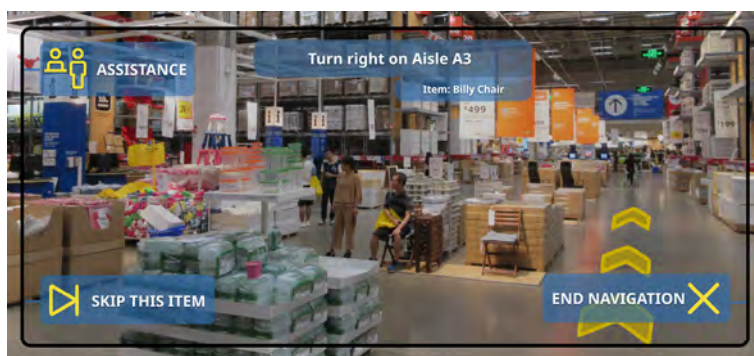
This is the opening screen for when the user first operates the glasses. From here the user will notice text explaining how the assistance buttons work and the scan button as well. There are a total of four buttons associated with the glasses. The buttons are located on the sides.



The second screen is your typical screen where the user is browsing and where they are able to navigate around the store. The user can also browse there scanned items



The navigation screen directs the user to there item of choice. When they have arrived at there item they can end the navigation or to skip to the next product.



Design principles analysis

Flexibility-usability tradeoff

The users of the Ikea glasses will likely vary in their understanding of their needs which requires a higher degree of flexibility, especially since the glasses will be used when both browsing and looking for specific items. However, this could quickly make the system too complex, so we limited the number of actions available to the user to no more than three or four on the screen at a time. We also limited the navigation function to only be in the warehouse area to make the system more usable and straightforward.

Consistency

Our product demonstrates internal consistency through its color scheme, fonts, shape of buttons, and placement of graphics throughout all the screens. Our color scheme and fonts are also consistent with the Ikea branding to demonstrate unity with the store. Our “buttons” on the screen are rounded rectangles that are consistent with the look of real buttons to indicate to the user to press the physical buttons on the sides of their glasses.

Mental Model

We based our design off of some mental models we knew most users would have experience with from our interviews. We modeled our navigation visuals after Google Maps because most people are familiar with that system. Additionally, our icons are common symbols used in other systems so users can rely on their experience to infer functionality.

Performance load

The performance load with our glasses is very low. There are very few steps with every task. All possible options are displayed on the screen at all times. From there, they need only be selected and the process is started, step by step, leaving the user very little opportunities for error. The kinematic load is limited to pressing buttons on the side of the glasses.

Wayfinding

The rectangle in the middle of the screen when the user is browsing indicates what section of the store they are in which helps them orient themselves. Our navigation system automatically selects the quickest route to the item they are searching for in the warehouse section which limits the complexity of their route decision. When the user is navigating through the warehouse the next step in their route is indicated in the top center of the screen and the following step is placed right below that. There are also arrows imposed on the user’s surroundings to further offer breadcrumbs to

guide the user through their route. When the user finally reaches the item they were searching for, they will be notified that they have reached their destination.

Hick's law

On each screen we limited the number of options available to a maximum of three or four. The limited options available will reduce the amount of time it will take for a user to make a decision, according to Hick's Law.

Picture Superiority Effect

We use pictures on the "shopping cart" screen. The pictures are right next to the name of the item to help the user remember exactly what item they put in their shopping cart. We also use icons for all of our buttons so the function of the button is more easily recognizable to the user.

Chunking

We plan on grouping similar items in the shopping cart together. For example all lounge furniture will be grouped together and all kitchenware items will be grouped together. These chunks of information will help the user remember what they have added to their shopping cart. Otherwise, there are very few places where the user would need to remember or recall information when using our glasses.

Similarity

All the buttons have the same shape, size, and color combinations indicating that they are buttons that are accessed in the same way. On the other hand, the large box in the top center of the screen is differentiated from the buttons by having a larger size, no icon, and lowercase text. This was intended to demonstrate that it was not a button and was more indicative of important information relevant to the user's current position.

Proximity

When the user is in navigation mode the next direction the user must follow is in the top center of the screen. Directly underneath that is the following direction. The close proximity and the differentiation in size of these two instructions visually indicate to the user that the directions are related and follow each other. On the other hand, the buttons are all spaced out around the corners of the screen to indicate that they do have different functions.

Alignment

All of the elements of the application that the user can interact with are aligned on the corners of the screen, with the user's visibility not being blocked by anything in the center. The buttons on the AR goggles correspond with the location of the buttons

and their alignment on the screen. This alignment ensures that the user can quickly find any button they need, while still being able to focus on navigating the store in front of them.

Fitts's law

The buttons on the screen were balanced to ensure that they were large enough to easily identify and differentiate between the others. Because the targets are placed on opposite corners of the screen, the placement makes hitting the right button easy, while also making errors more difficult to pull off.

Visibility

In order to make sure the application's options were easily visible, the application maintains a very simple feature set, with a few menu options that hide their more complex settings under buttons. Possible actions are explained simply, with enough detail to ensure that users know exactly what all the buttons on their screen are for.

Recognition over recall

By using familiar icons throughout the application, users who may be new to the application will still be able to quickly identify how the application works, regardless if they skipped the screens in the onboarding phase of the application. The button text doesn't have to entirely explain the functions of the application, and functions mostly to pinpoint the context in which the buttons are used.

Picture superiority effect

The use of large icons helps users quickly identify the functions of the application with smaller text to accompany it. The icons do the heavy lifting, then the smaller text helps clarify the meaning of those buttons in a context that's more specific to the application. For example, the shopping cart icon is easy enough to identify as the cart, but it's more specifically a list of the items you've scanned in the display areas.

Serial position effect

While there is an onboarding phase where the screen explains the various functions of the application, if the user forgets the details presented to them, the buttons are always on screen. Since the application is simple enough and the buttons explain their functions intuitively, it is unlikely that the user would forget how the application works while operating the goggles.

Signal-to-noise ratio

Because of the simplicity of the application, the user is allowed to make the shopping experience the focus of their time at Ikea. The buttons are all out of the way to ensure that the view is not obstructed, and all of the functions are rounded down and

simplified. Even if a user needs assistance, rather than making the application handle the process, it will send for an employee to assist. With minimal text and complication the signal remains strong throughout the design.

Accessibility

To ensure that the application is accessible, the application uses a large font size of 18px, which is higher than the recommended 16px for body text. The contrast on the text is also AAA compliant, ensuring that users who struggle with vision will be able to read the screen. The application is also incredibly simple, assisting in the inclusivity of the design.

Control

The application was designed to streamline the shopping experience at Ikea, so the controls were designed to enhance the experience of all users, regardless of experience with technology. The application explains itself in the onboarding screen, then uses simple icons and functions to make the experience as efficient as possible for the shopper. In the event that additional assistance is needed, the assistance button would be usable in that instance.

Errors

With the application being rather simple in its design, the possibility of errors is minimal but still needs addressing. The text is simple and clear in its explanation of the buttons, but if the wrong ones are pressed, there is an undo button that appears after an action occurs. This error forgiveness extends into the navigation portion of the application as well. If a user no longer wants an item, they can skip navigating to the item to look for other items on the list.

Forgiveness

The users can cancel their navigation in the form of a button on the side of the glasses when arriving at their destination. They can also remove items from their shopping cart. This allows for forgiveness while shopping throughout the store.

Feedback

When the user puts on the glasses they can view short descriptions of each button. This will give them an understanding of the application before they start using it. The form of feedback the user will notice will be in their shopping cart and in the form of scanning a QR code.

Aesthetic-usability effect

With our product being aesthetically pleasing to shoppers, we would hope they would want to use the glasses each time they shop.

Expectation effect

Our product allows users to walk into Ikea or any department store and use these glasses. In doing so, they can then get through their shopping list faster with the help of the navigation system. The glasses would direct them to the warehouse in search of their purchase. We would then hope the customer would leave feeling less stressed.

Affordance

Our application would be used in the form of AR glasses. This would allow for users to borrow a pair when walking into a department store and wearing them throughout their shopping experience. The glasses would have a camera and 4 buttons on the sides. The camera would scan a QR code and then take the user to the location of their product.

Color

Our color scheme is based on Ikeas colors because our AR glasses would be implemented in an Ikea store. Color is also important in the icons because these are the buttons the user will use to navigate themselves around the store and keep their cart stocked.

Highlighting

In our user interface, we highlight the direction in which to take. So, they can quickly get to their item. Our product is a navigation system that will allow the user to pinpoint where they are in the store. Then when they navigate themselves to the product they need in the store. The navigation system will take them there in the form of arrows. This highlighting method allows for a smooth process.

Legibility

Our product being legible is a crucial point in the design process. Especially when it comes to the icons that are displayed, when a user presses a button on the side of the glasses, the icons are what allow them to see what task they are trying to achieve. For the icons to stand out, we designed a blue background behind each icon. We took down the opacity so it wouldn't be too overpowering and so you could see the background coming into view.

Iconic representation

Our icons are of importance to our product. The icon for, for example, for the scanning and shopping cart are universal icons. Everyone knows by looking at the icons what they represent without having to read the label. The representation of icons has become such a predominant part of our society.

Ethical considerations

Some ethical considerations arise in terms of accessibility for users who are visually and/or physically impaired, limiting their use of the device. Our device depends on small buttons on the glasses as well as relatively good vision, so those would have to be accounted for when considering the types of users mentioned above. Creating a device that is supposed to assist in making Ikea more accessible would be a problematic if its implementation excluded many users who'd benefit from the features provided by the service. This could be iterated upon in later versions, where more features allow for a more inclusive experience.

Other issues arise in the potential for the devices to be vandalized or stolen when provided as a free service, in which a few users who break the device or take it home by mistake, preventing the device's use to those who need to use it after them. Users could also risk injury if they're not paying attention with the goggles on and run into someone else or end up where they are not supposed to be. These issues are minor but could be addressed with processes such as a designated drop off spot on the way out of the store, and warnings for users. Warnings could range from those watching out for other customers, to warnings that remind customers when they are near the drop off zone for the goggles, near the exit.

One of the more difficult problems to solve is the issue of privacy. Having a camera worn by users at all times is a very concerning feature for many users who may not want their data logged at all, even their name were not tied to it. Other customers who aren't using the goggles might also feel like they're being watched by the company without their consent, especially in regards to more private areas of the store like bathrooms. The logging of this data may also leave customers uncomfortable about how much data Ikea is keeping for their own sake. Unlike the other problems, this one will require more ethical consideration, but it's critical that the user's privacy must be respected. Ensuring that the cameras turn off in specific zones of the store such as bathrooms would be critical, as well as making sure that the camera is only capturing data when it needs to scan QR codes, and only for QR codes. It would also be important to have a reminder to the customer when they reach those zones, so that they know the camera is not recording. Being up front to the consumer about what data is or isn't kept would also go a long way towards establishing trust with the customers, regardless of whether or not they use the product.

Future enhancements

There are few enhancements that could improve the glasses in the future that would make them more accessible and expand their capabilities. One feature that would be helpful to the user is access to a map of the entire store that indicates where they are located. This could help a user identify their location in relation to the large areas of the store. Another feature that might be useful is directions to the bathroom or cafeteria area. This would be a quick and easy way to have step by step instructions to commonly visited areas of the store at the press of a button. Another helpful feature would be a pop up with detailed information about the product right after the user scans it. Finally, the glasses are not very accessible to people with disabilities. Future versions of the glasses could have audio features for those who are visually impaired or a handheld remote with large buttons that are easier to press than the small buttons on the sides of the glasses.