

# Wallfie

## Interactive Photo Wall

Malvika Bansal, Leslie Filko, Olesia Koval, Shivin Saxena  
H564 - Prototyping Interactive Systems  
(Final Project Report)  
Instructor: Dr. Stephen Voida

# Table of Contents

[Introduction](#)

[Early Ideation - Sketching the Product Experience](#)

[Functional Design](#)

[Early Prototypes \(Paper Prototyping\)](#)

[Cognitive Walkthroughs](#)

[Design-Crit Feedback from Class](#)

[High-Fidelity Prototypes](#)

[Informal User Testing](#)

[Feedback from Participants](#)

[Design-Crit Feedback from Class](#)

[Changes made in the Revised Prototype](#)

[Design-Crit Feedback from Class](#)

[Prototype Usability Test \(Formal User Testing\)](#)

[Wishlist](#)

[Lessons Learned](#)

[Appendix](#)

[User Testing Script](#)

## Introduction

---

Our initial ideation included four primary options to explore: a digital stand-in for taking group or themed photos, an interactive screen for providing movie reviews at theaters, a public fountain that detects nearby people through pressure plates in the surrounding ground, and reacts with changing lights and musical notes; and finally, a comment wall that allows users to leave brief messages, either from the screen itself or from their mobile device when standing nearby, and “throw” them across the screen. A vote among our team members narrowed these ideas down to the photo wall and the fountain. During the course of our conversations, we decided that combining the photo wall with the comment wall would be the best way to approach that specific option. When these ideas were presented to our classmates, we received a great deal of feedback that the fountain option would be far more difficult to prototype, and the photo wall sparked the most discussion and critique. We therefore opted to explore the photo wall idea.

Our application domain is a large screen interactive photo wall, which can be used at the theme parks, malls' resting areas, or points of interests. The screen allows users to take personal and group photos with customizable selected backgrounds and accessories (crowns, mustaches, etc. that “stick” to customers via tracked movements) that can be selected and cycled through with gestures. To take a photo, all users on the screen say “Cheese!” at the same time. At the end of each session, the system prints a paper photo card with QR code that allows users to download their digital photo, and information how to receive a printed photograph. When no users are taking photos, the display defaults to a slideshow of photos of people who took pictures previously with the system.

We began the project design with generating many ideas and variation. Creating variety of sketches helped us to get the right design and develop it. Once we had a conceptual vision of the future design, we had built a flowchart of the functional design. We then analyzed the workflow and built a paper prototype that represented our early design. Cognitive walkthrough, conducted with our classmates validated our design and emphasized hidden issues. Then we built a system interactive prototype, and conducted three informal user evaluations. Testing pointed out that our design had a lot of unclear area in the interface that needed improvement.

Finally, we redesigned our interactive prototype and completed three formal usability testing. Our final interactive prototype was met with positive responses. Nevertheless, our user testing participants had number of comments and suggestion which we plan to incorporate in our future design of the Interactive Photo-Wall

## Early Ideation - Sketching the Product Experience

To begin with, we drew our inspiration from large interactive public displays and large photo booth installations. While significantly different, we felt that there was something that could bridge these two ideas and could be used to engage live audiences with a fun, collaborative activity.

The comments wall (as shown in the sketch below) is based on the public comment wall such as that installed in the Campus Center, IUPUI and would allow patrons to leave comments within a public setting such as restaurants.

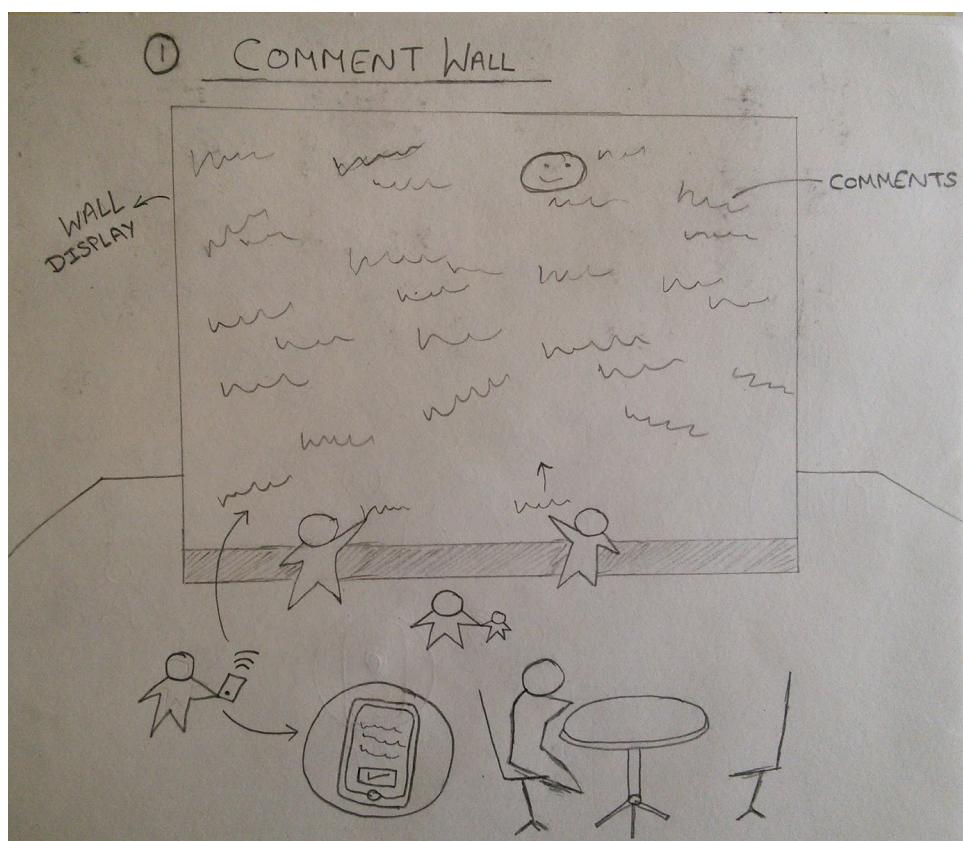
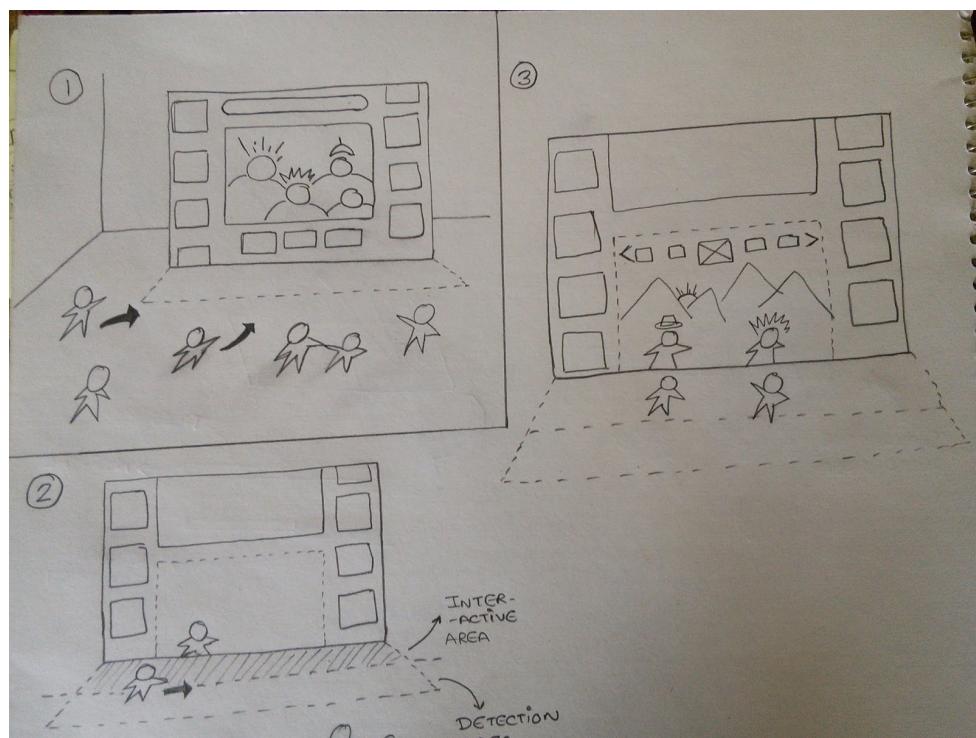


Photo-booths are a common attraction in museums, amusement parks and other recreational areas and allow users to capture memorable moments with fun, customizable backdrops, accessories and much more. After some initial brainstorming and peer feedback, we decided that a large, interactive photo-booth installation that makes the most of modern technology will be more suited for the nature of this project.



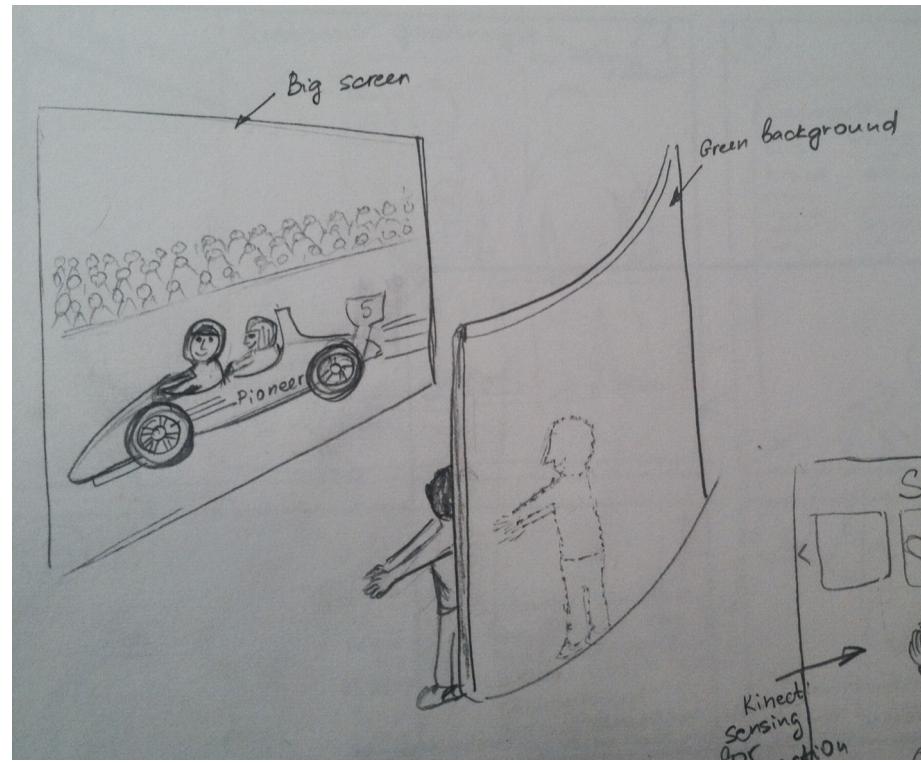
Our early vision of this idea was interactive vertical display where users can browse through backdrops, accessories and text-captions via gestures or voice commands or some combination of touchless interaction techniques. The idea was to create something that attracts users from a distance, engages them in a fresh experience that would be based on a familiar concept.

With this conceptual vision in mind, we generated some sketches to better understand the look and feel of the device and the interface, the interaction design and the overall experience of using this installation in a typical setting.

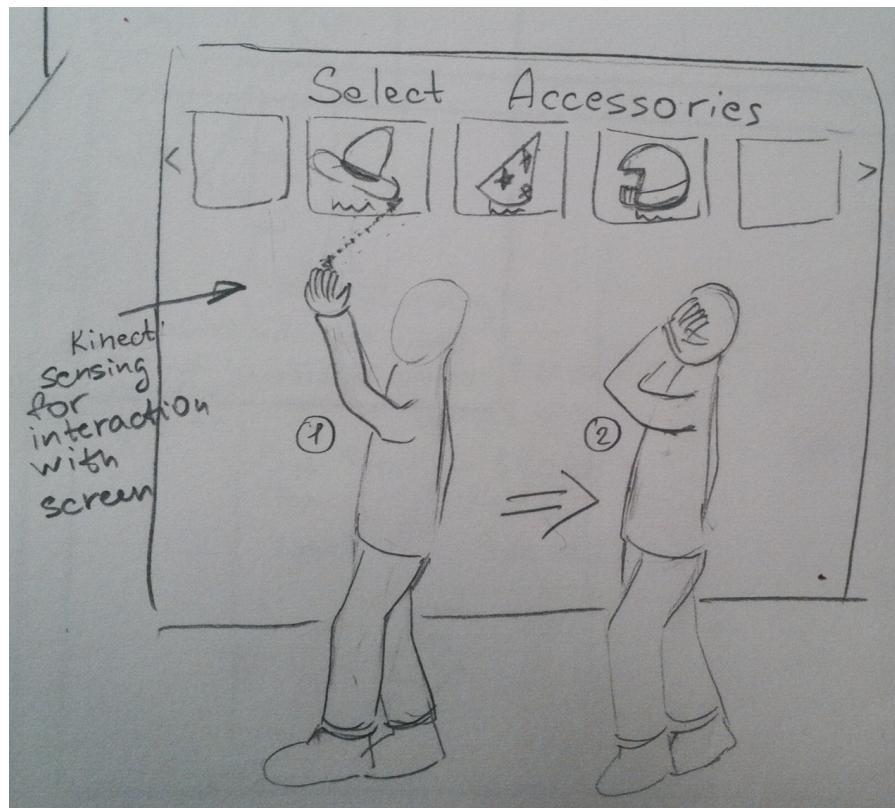


People at public settings take notice of the large installation and out of curiosity, approach it. As they enter the interaction range, the device offers them visual feedback to suggest the interactivity with the interface.

# WALLFIE - Interactive Photo-Wall

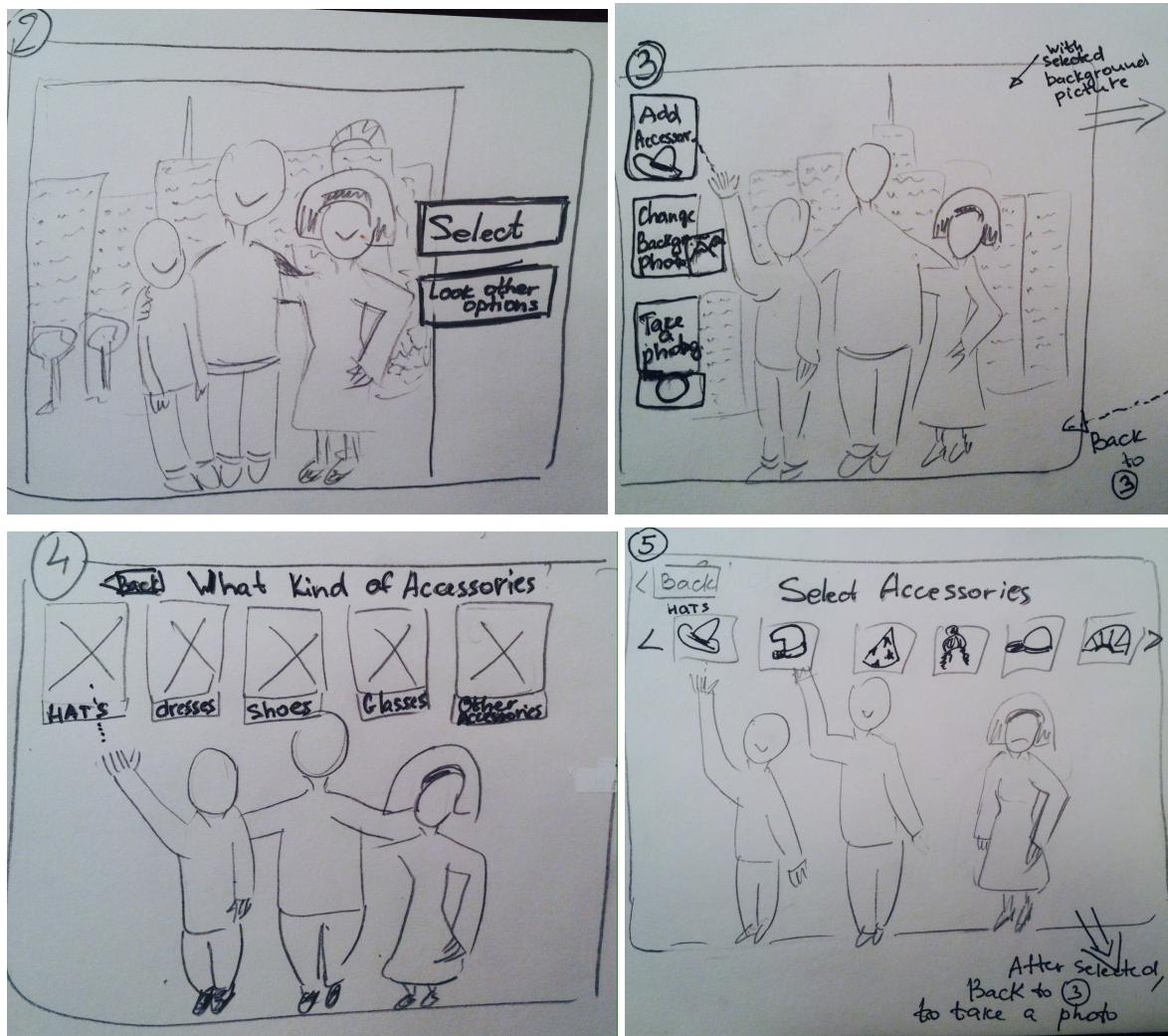


A possible installation strategy where the device may be placed in a close/semi-private setting with a screen in the background.



Using simple swiping gestures, recognizable by a motion sensing device such as the Kinect to interact with the sliding carousel to browse through backdrops/accessories.

# WALLFIE - Interactive Photo-Wall



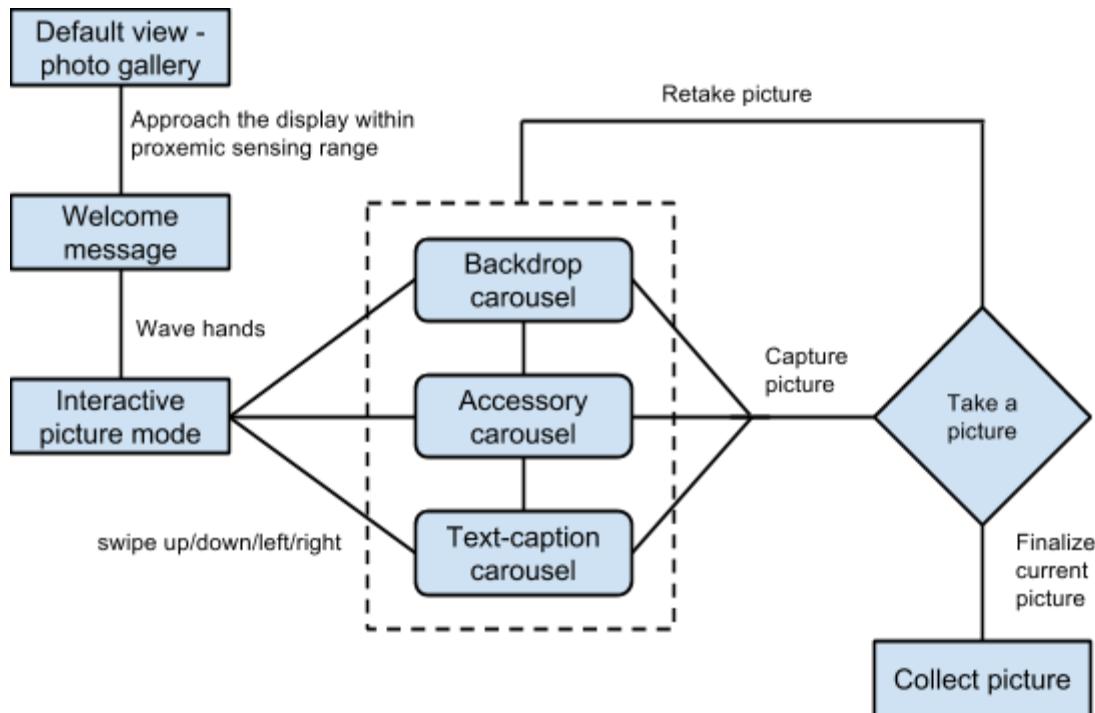
Preliminary ideation through rapid sketches that illustrate how multiple users might interact with the device.

## Functional Design

Based on initial concept ideations and comparable products in the market, the key elements and user requirements identified include:

- Visually appealing layout of photos to capture user attention.
- Proxemic sensing to determine interaction range and identify users only within the proxemic range.
- Touchless interaction techniques with ample visual aids for easy of understanding and helping new users.
- Consistent, minimalistic interaction sequence to make the process faster and smoother
- Customizability and diversity of configurable components to make the experience engaging and fun.
- Multi-user support to facilitate group photos.

The proposed interaction sequence can be seen in the flowchart below:



## Early Prototypes (Paper Prototyping)

---

In human-computer interaction, paper prototyping is a widely used method in the user-centered design process, a process that helps developers to create software that meets the user's expectations and needs—in this case, especially for designing and testing user interfaces using simple paper cut-outs/sketches. It is a throwaway prototyping technique and in our experience, works wonders in avoiding the overhead of generating even low-fidelity prototypes of complex systems while giving very useful feedback with skillfully constructed paper mockups of user interface elements and effective user scenarios.

For us, the preliminary challenge was to generate an effective paper representation of a large, interactive system that target users would be able to relate, and helps them paint a mental picture of what the actual system might look like. To mock up the initial image gallery screen and other interactive screens, we used a combination of post-it notes, hand-drawn sketches and paper cutouts to represent different UI elements, transitions and feedback.



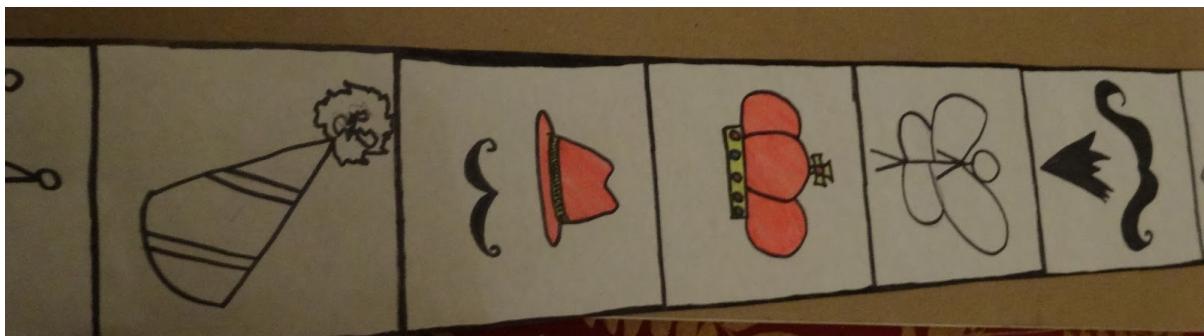
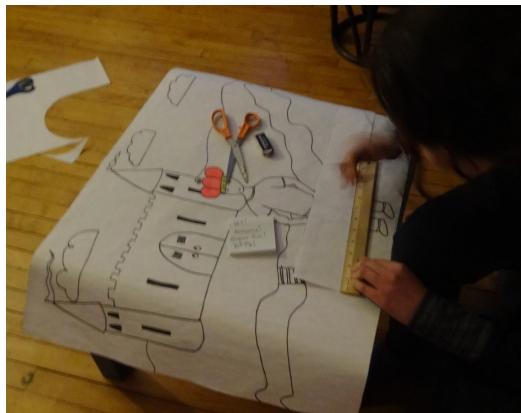
# WALLFIE - Interactive Photo-Wall



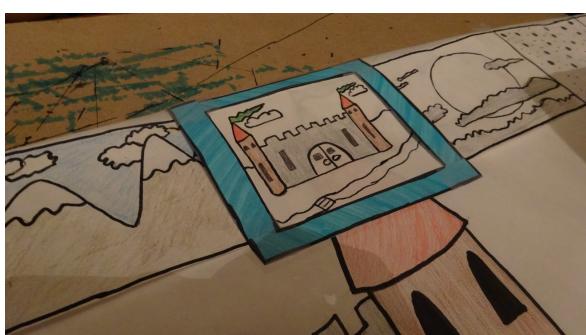
With so many screens and UI components to generate, the team was able to effectively divide the work with every member contributing to every activity: cutting, sketching, pasting, coloring and putting it all together.

UI components such as buttons and smaller controls were best represented by simple cutouts. We used larger sheets and sketches characters and custom backgrounds on them to represent customizable backdrops. The backdrop, accessories and text-captions carousels were represented by long, paper reels that could be slid in and out along the boundaries of the board (that would function as the main screen). The process is illustrated below:

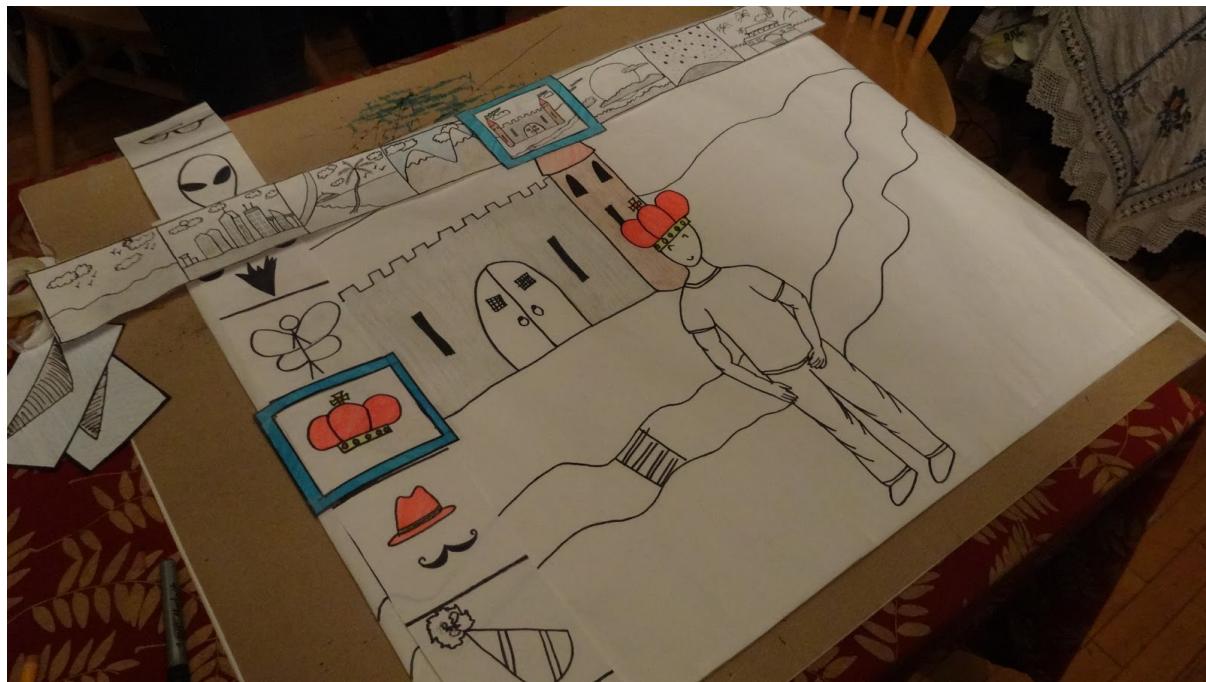
# WALLFIE - Interactive Photo-Wall



To indicate which backdrop/accessory/caption was currently selected, we fashioned frames (blue) that would enable use to slide the carousel from underneath and freeze frame at the desired backdrop/accessory/caption. This is shown below:



Putting it all together:



After much brainstorming, we decided to place the three carousels along the edges of the screen in a way that that user could swipe through the different customizable elements fairly quickly. As shown above, the user could swipe left/right and up/down to select a backdrop and accessory of choice, the effect would be shown in the space below. The figure of the man is representative of the user standing in front of the installation and conveys the idea that the user's image would automatically be morphed on the selected backdrop (that is, the actual real-life background would be eliminated and be replaced by the one on the interface).

To get a better feel of how we would use the prototype and to receive a better feedback, we envisioned a typical use-case scenario where the user might notice the large installation and then walk up to it. We then used a combination of narration and scene by scene transitions to show how a typical user might interact with this device.

# WALLFIE - Interactive Photo-Wall



## Cognitive Walkthroughs

---

### Design-Crit Feedback from Class

Our first round of feedback was received in class from peers who also fit the profile of a regular user who might use this product. We performed an informal cognitive walkthrough with our *paper prototype*, giving them a typical scenario, walking them through the entire sequence of interactions to take a photo with custom backdrop and accessory and had them evaluate each step. At every step of the interaction sequence, we tried to answer the following questions:

- Will the user try and achieve the same effect?
- Will the user recognize that the correct action is available and having done so, will they do it?
- Does the interaction make sense?
- Is this the appropriate and expected feedback?

Table: Correct sequence of actions for intended task

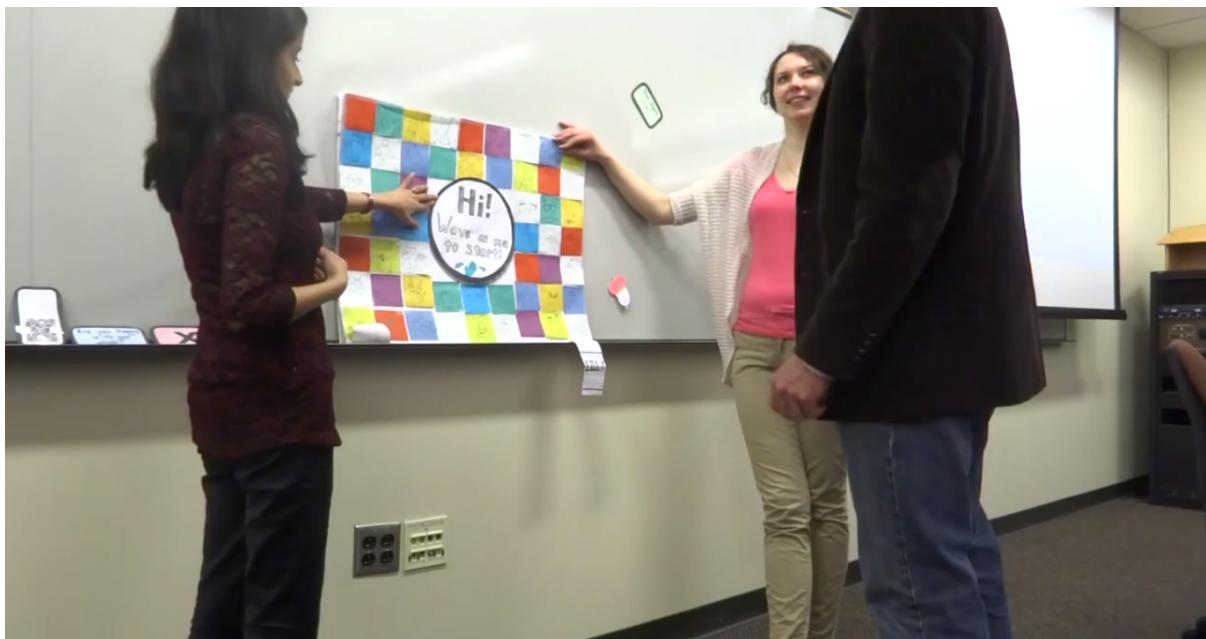
Action #.	Task/Step Description
1	Notice the photo-wall display. Approach the display unit.
2	Wave your hand to begin interacting with the display.
3	Cycle through the background-carousel by swiping left/right. Choose the background with the mountain scenery.
4	Cycle through the accessories-carousel by swiping up/down. Choose the accessory with the hat and moustache.
5	Cycle through the text-carousel by swiping up/down. Choose any text caption to go with the picture.
6	Select 'Take a photo'
7	You are happy with the photo. Select the checkmark to finalize.
8	Scan the QR code with your smartphone.

After a couple of informal cognitive walkthroughs, we also had other peers simply walk up to the prototype and play around with the interaction such that they could give us some more open feedback.

Given below is a summary of our findings from this round of walkthroughs and the open exploration of the prototype:

- More pronounced and explicit visual aids that convey what this device really does. A more descriptive sign or some animation or any other aid that tells users upfront about how this device may be used. It's not obvious that this is a photo booth. Also, the proxemic range isn't clear. How close does one need to get for this to work perfectly.
- Using a virtual cursor might be helpful in suggesting a mouse-like familiar interaction but one that can be controlled with hands. The touchless interactivity proposed is not visible and clear.
- Some participants were concerned that users may not understand how the device works even as they browse through backdrops/accessories/text-captions. Do they capture a photo using the device or take a selfie using their personal smart devices against the chosen backdrop?
- Users may need prompts and text instructions in addition to other forms of visual aids to guide them through the entire interaction sequence.
- Not all users may be familiar with QR technology and scanning the code on the interface adds another layer of complexity and time delay in that people may either not know what to do with the code or may not have the requisite app to scan it and will have to first download scanning apps first.
- Overall, the experience looks fun and appealing. Users might be inclined to retake photographs (maybe with additional friends). Adding the recently captured photograph to the gallery will serve as additional feedback for confirmation.
- Having the option to print the photo at a nearby kiosk might be a beneficial option for some.
- Maybe use a 4X grid of photos that immediately reminds of conventional photo-booths.
- It's not evident how multiple users would interact with this system? How would the user control be defined and transferred amongst the group? Raising one's hands or performing a certain gesture/hand-movement to gain control?
- Assuring group consensus to capture or finalize the photo? (What if someone in the group disagrees?)
- A potential use case for this device could be to theme it in a manner to prime people's mindset for forthcoming attractions, say a roller coaster ride as they wait in (or before entering) the queue.

# WALLFIE - Interactive Photo-Wall



# WALLFIE - Interactive Photo-Wall



## High-Fidelity Prototypes

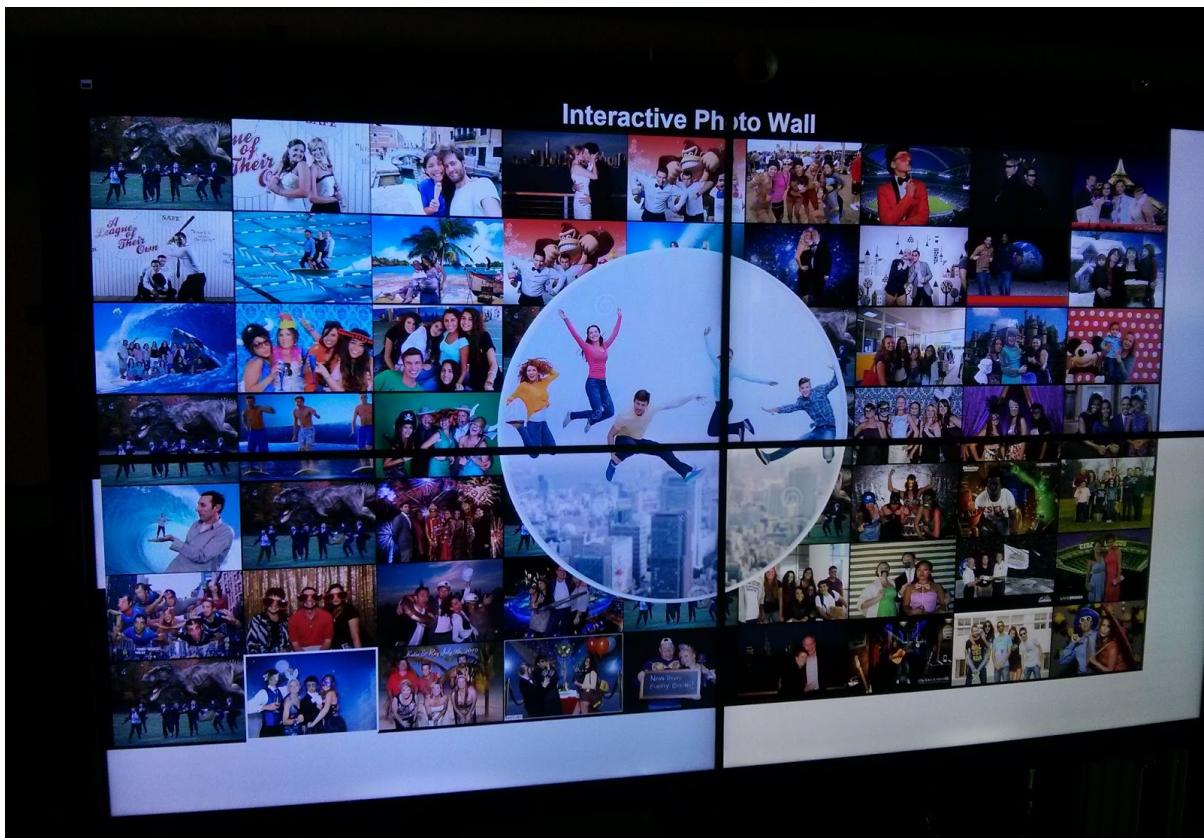
---

(Link to current working prototype: <http://l840q1.axshare.com/>)

The Hi-Fi prototype was generated using Axure and some HTML code to integrate a webcam into the interface. We wanted to make the prototype as interactive and believable as possible but owing to the tight timeline and the general skillset of the team, we opted to go with a prototyping tool such as Axure than code the prototype using HTML + JavaScript, such that the work could be distributed better and we could have a functional working prototype built soon.

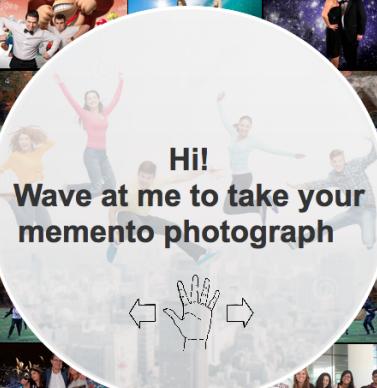
We decided to download sample images from the Internet to generate the photo wall, backdrops and accessories and used a custom HTML script that would allow us to use an integrated/external web camera in an inline browser frame to simulate the effect of seeing one's reflection on the interface against customizable backdrops.

The Hi-Fi prototype was developed for and tested on the IQ Tilt in the AVL. The Tilt serves as a comparable display unit and gives a good idea for how the actual device might look and feel like.

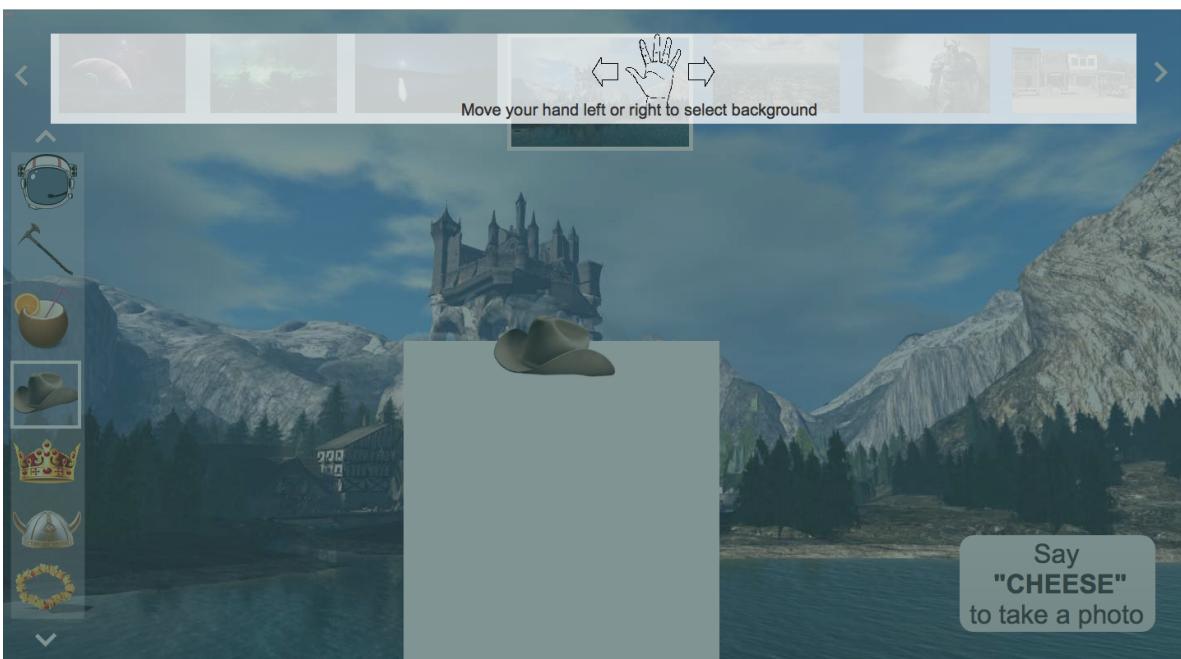


The default screen that shows up when no users exist within the recognizable proxemic space.

# WALLFIE - Interactive Photo-Wall



Once a user enters the interaction space, the default screen changes to display a welcome message and prompts the user to wave their hands to begin.



Visual aids popup on the interface, guiding users on how to interact with the system to be able to browse through backdrops and accessories. When the visual guides popup, other UI components fade in the background to draw the user's attention to the guides.

# WALLFIE - Interactive Photo-Wall



A user working with a backdrop/accessory of her choice. The white box seen on the interface is actually an embedded webcam view that wasn't working at the time due to the unavailability of an external webcam.

## Informal User Testing

---

### Feedback from Participants

Our second round of informal feedback, done on the Hi-Fi prototype (v1), was gathered by recruiting 3 participants (amongst friends and peers) who had not previously seen the interface. These participants fit our target user profiles well. We asked them similar questions for general feedback and some specific questions regarding perceived learnability, potential use-cases and interaction issues. We had them use the system they would use in a real life scenario, asking them to think aloud at every step of the interaction sequence and making a note of their expectations and comments.

Given below is a summary of our findings from this round of walkthroughs:

<b>General Feedback</b>	<ul style="list-style-type: none"> <li>● Participants could make sense of the purpose of the device from a distance and even better so, when they approached it.</li> <li>● The photo collage succeeds in drawing attention.</li> <li>● Visual aids such as text and animations were able to guide them and conveyed the affordance that this system responds to gestures.</li> <li>● The slide-menus for choosing backgrounds and accessories work well and the interaction is convenient. It's nice to receive immediate feedback when browsing through backdrops/props.</li> <li>● The interaction technique for 'Take a photo' is not immediately clear and inconsistent with the experience of using the system until that point.</li> <li>● Mixed reactions to using thumbs up/down for proceeding with the current photo or retaking it. Visual aids help.</li> <li>● Overall, participants commented that this was a fun experience and they would use such an installation in real life.</li> </ul>
<b>Learnability</b>	Participants commented that the system was already quickly learnable and could be improved further by adding more visual aids (text, animations) to accompany actions.
<b>Retaking photos</b>	All participants agreed that they would like to use this feature in case they didn't like the current version of the photo or just to have fun.
<b>Potential Implementations</b>	At malls, concerts, weddings, amusement parks, museums etc.
<b>Key Problem Areas</b>	<ul style="list-style-type: none"> <li>● It's not immediately clear what the right interaction</li> </ul>

	<p>technique is for taking a photo (touch or touchless?) Participants' first instinct was to simply touch the button owing to the lack of instructions or visual aids.</p> <ul style="list-style-type: none"><li>● It's not clear how multiple users would use this product simultaneously. Specifically, it wasn't clear if one person would be in control or how the control could be traded between users in the frame.</li><li>● It's necessary to keep the experience as consistent as possible with ample visual aids and textual instructions to guide users at all times.</li></ul>
--	---

## Design-Crit Feedback from Class

Feedback on the Hi-Fi prototype (v1) was received from peer UX experts after a brief demonstration of how a user might interact with the device. For the sake of demonstration, one team member posed as a first-time user and another member performed a Wizard of Oz walkthrough for the interaction experience.

Summary of feedback:

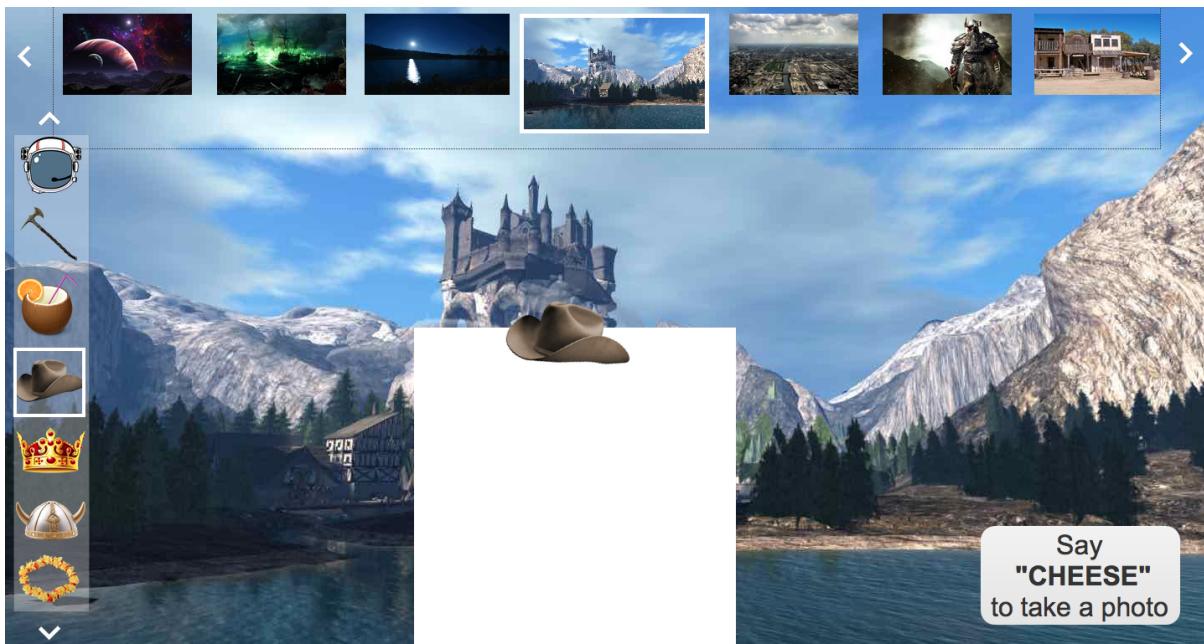
- The current version of the interface sets great expectations and is fun to use at first but the novelty factor may wear out soon. There need to be other ways to keep the user engaged.
- The first version of the implementation was well received for the most part, keeping in mind the limitations and the affordances of the tools used.
- Investigating the experience of using touch interaction versus touchless techniques.
- Theming the sample photos used in the gallery with an imaginary/existing setting to add to the context.
- Placing the accessories over the web camera view would help people better understand the intended functionality.
- The photo card with the QR code and further instructions was a good idea.
- Considering the right metrics for user testing? An open exploration of the prototype might not be feasible since not all elements work in the prototype.
- Using more dynamic backdrops in the form of animated GIFs or video animations to make the experience different from conventional photo booths and to add to the novelty factor.

## Changes made in the Revised Prototype

- More explicit text instructions that tell the user exactly what needs to be done to proceed in the interaction sequence.
- Using a slideshow in the welcome screen instead of having the one single image magnified in the center.

# WALLFIE - Interactive Photo-Wall

- Using dynamic animated backdrops instead of static ones (implemented by replacing static images with GIFs).
- Repositioned the accessory over the web camera box so that users may better understand the intended functionality.
- Replacing 'Take a photo' prompt with a more natural 'Say Cheese!' voice command to take a photo.
- Adding the captured photo to the gallery by having it magnified in the center circular space to emphasize that the recently captured photo has now been recorded by the system.



Replacing 'Take a photo' prompt with a more natural 'Say Cheese!' voice command to take a photo.



Adding explanation for the gestures



Adding the captured photo to the gallery

## Design-Crit Feedback from Class

- Most of the changes made to the prototype were well received.
- Debating the deployment of this installation in a semi-private enclosure vs. an open public setting.
- Using more explicit visuals to convey that the device can sense you to give the affordance that this doesn't need to be touched.
- "Say cheese" is a good touch because it is a form of interaction that almost everyone is very familiar with.
- Using footstep markers on the floor to give an idea of the interaction range
- Using better visuals for the thumb images, they look more like icons that make it look like buttons that need to be clicked.
- Maybe try using virtual cursors as well on the interface and test if that's easier to understand and control.
- Testing how to make the visual aids (animations/text) convey interaction guidelines better is challenging and offering us a chance to learn from our testing experiences.

## Prototype Usability Test (Formal User Testing)

---

We developed a user testing script (included in Appendix A) and invited three participants to test the high fidelity prototype on the IQ Tilt. Of our participants, one (P1) had used public interactive screens once or twice to find directions in a mall, while the second participant (P2) had moderate experience with interactive displays as exhibits in museums and art installations, and the third participant (P3) had extensive experience with interactive displays in the form of everything from public kiosks such as ATMs, to regular use of the IQ Tilt itself. Similarly, P1 had never used a traditional photo booth, while P2 was moderately familiar, and P3 was very familiar with them. This breakdown of participants gave us a solid foundation to examine different levels of user experiences with the prototype.

All users were asked to stand back from the IQ Tilt to begin the user testing, and pretend they were at a popular amusement park when they came upon this device. Users were asked to approach the wall, select the "Night River" background and one accessory, and take a photograph. Then, the users were asked to retake the photo using the "City" background, confirm that they liked the photograph, and take a printed photo card. At the same time, one of our team members used a nearby mouse and keyboard to control the prototype in a Wizard-of-Oz style. At each step in the test, users were asked what they thought they should do *before* they interacted with the prototype, and were asked what they thought of the interaction *after* the step was completed. The participants were also asked a series of questions about the concept and application of the photo wall in general following their user test.

For the first task, where users are presented with the default screen showing an array of other people's photographs and a message to wave when they move closer, most participants said they thought the screen would take their photograph when they wave, immediately - that is, without providing background and accessory options. P1 was not sure what the screen was presenting her with, and stated that there needed to be more visible feedback about the purpose and function of the wall prior to its use.

The second task involved selecting the "Night River" background from a series of options by using swiping gestures, and any accessory, and then to take a photograph by saying "Cheese." The first thing we noticed was that, instead of using swiping gestures, users followed the example of our indicator icons and rapidly moved their hands back and forth or up and down, which was not our intention. This was not anything the participants remarked on, however, since they did not know the intended interaction. One issue all participants did bring up, on the other hand, was the sequence of interacting with the background and accessories. All participants (separately) noted that they would prefer to be walked through the process step by step, instead of being presented with three interaction options at once (background, accessories, and taking the photo) and choosing which to use first. We had intentionally left this kind of walkthrough instruction out of the prototype because we assumed that it would be faster

to give the user immediate control, and would cut down the overall time of the process. It was interesting, then, that users preferred a slightly slower, guided interaction over a faster, more open interaction. No users struggled with the "Say Cheese" command to take a photo.

Next, participants were presented with the confirmation screen showing the photo they had taken, and two options - a "Thumbs Up" to continue, or a "Thumbs Down" to retake their photo. Using one of these gestures would result in the respective command. The participants were asked to retake the photo with the "City" background. One user was not sure whether they were to use the same swiping gestures as before to select a background or not, even though they were presented with the same indicator animations. Two of the users did not understand that they should have actually made a thumbs down gesture in order to retake the photo, regardless of the text indicators included in the prototype. Participant 3, who had continually used touch-based gestures for each task so far, continued to use touch-based gestures, which inadvertently worked due to the touchscreen nature of the IQ Tilt.

Finally, users were asked to confirm that they liked their photograph, and take a printed photo card. This task received mixed feedback from participants. Participant 2 felt this step was pretty simple and straightforward, but would like to watch his photo shrink down to become part of the wall collage. Participant 1 would prefer the option to choose whether or not their photo would be featured on the collage, which we had also excluded to reduce the overall time of the process.

In our post-test questionnaire, participants had mixed responses to whether they would use this in a real-world scenario. Two of them mentioned that they would use Wallfie as a fun group photo opportunity if the backgrounds and accessories were appropriately themed for the setting. One participant indicated he would not be very inclined to use this, and while he could see potential for implementation, did not know what would be remarkably different about this style of photo booth from similar existing products in museums and similar settings.

## Wishlist

---

The following are features we wish we could add in future iteration of Interactive Photo-Wall:

- Developing the possibility of selecting accessories by group of people during one photo session.
- Incorporate functionality to allow accessories to “stick” to users and follow their movements.
- Testing the high-fidelity prototype with a group of participants during one testing session to understand the system usability for multiple users when they take a group photo.
- Adding possibilities of creating 2-5 second video, which can be downloaded by users. In this case, the final effect of the default screen would be a giant scrapbook of moving photos.
- Research and implementation of better visual aids which will be able to convey more clear interaction guidelines.
- Find and add additional features which would keep users engaged.
- Finding stakeholders and building the real Interactive Photography-Wall system, which can be placed at amusement parks and malls.

## Lessons Learned

---

- Wallfie has a good learnable pattern, however it still needs further improvement in visual aids.
- The system can be installed in amusement parks. One example of its effective use can be for entertaining customer experience when they need to wait in the long lines to rides.
- Clearer instructions, including walkthroughs and more appropriate indicators would be necessary in a real-world implementation.
- Users would prefer a balance between guided interaction and a faster overall process, rather than just a faster overall process.
- Touch-based interactions should also be supported for users who are unfamiliar or uncomfortable with gesture-based interactions.
- Dividing and working in a team is very helpful in terms of brainstorming for ideas or solutions and complete the product in the timeline provided.
- Team members with different skillset and background makes a better and well-thought of product.

## Appendix

---

### A. User Testing Script

#### Introduction

Let me start by saying thank you for agreeing to participate in this assessment of our prototype. Our goal is to determine how user friendly is our designed system. We're asking people to try using our system so we can see whether it works as intended. Please feel free to express any opinion you may have and don't worry, you will not hurt our feelings. As a participant, you will be completing four tasks with using our prototype. If at any time you are struggling or have any questions, please let me know and I will help as I can. We will capture audio and your comments, which will be used only for the purpose of evaluating the design. If you would like to end the assessment at anytime, you are welcome to do so. Do you have any questions?

---

#### Background Questions

- Did you have experience with public interactive screens?
- If yes ...
  - What kind of interactive screens?
  - What did you like about the process of interacting with such system?
  - What did you not like about the process interacting with such system?
- Did you have experience with photobooths?
- If yes ...
  - What did you like about the process interacting with such system?

- What did you not like about the process interacting with such system?
  - Have you had any kind of experience with devices that support touchless interaction (gestures, voice)?
  - If yes ...
    - Can you describe what particular system?
    - What did you like about this?
    - What did you not like about this?
- 

**Scenario:** You are spending some time at a popular amusement park and exploring the place, when you notice a large, color wall display somewhere along one of the walls. You then approach this display and as soon as you do so, the wall prompts you to interact with it.

**Task 1: Approach the display and try to understand its first message. Navigate to the next screen.**

- Can you briefly explain what this screen is showing you?
- Is there anything you would change about this screen?
- Where do you think it will bring you after you waive?

*Let's give it a try...*

- What do you think about this process?
- How would you rate it on a 1 to 5 scale if 1 was strongly dislike and 5 was strongly like?

**Task 2: Choose "night river" background and one accessory. Take a photo**

- Is there anything you would change about this screen?
- What do you think about this process?
- How would you rate it on a 1 to 5 scale if 1 was strongly dislike and 5 was strongly like?
- What would you do next?

### **Task 3: Retake a photo with a city background**

- Choose "Retake".
  - Change on "City" background
  - Bring to the next step
- 
- What do you think about this process?
  - How would you rate it on a 1 to 5 scale if 1 was strongly dislike and 5 was strongly like?

### **Task 4: Take a printed photo card**

- What do you think about this process?
  - How would you rate it on a 1 to 5 scale if 1 was strongly dislike and 5 was strongly like?
- 

### **Post-Test Questions**

- Overall, what are some things you would improve about this interactive wall?
- Name three things you like the most about the Photo Interactive Wall
- Name three things you like the least about the Photo Interactive Wall
- Would you use this system and why?