

Design Document v1.1

Secure Self-Checkout System

Group 3

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Executive Summary

Proposal

The LPRC Group 3 team proposes implementing A.I. vision technology on self-checkout (SCO) units based on the following problems:

- Self-checkout units, since first introduced, have lead to an increased intentional and unintentional loss in retail stores.
- Users of self-checkout units find it to be an inconvenience and not as easy an experience as traditional cashiers.

The A.I. vision technology along with other interface designs will address these problems through the following goals:

- Create an interface that users with low technology literacy find intuitive.
- Introduce technology that will assist shoppers with their self-checkout process.
- Introduce technology that will help stores with unintentional loss and make users of the system feel safer.

Approach

Using the human-centered design model, we are approaching this problem by iteratively going through the hear, create, and deliver phases of the cycle. The initial hear phase consists of user research on various retail store customers, using their input to drive the creation of user personas, scenarios that aid in the process of understanding the typical user's needs and how to best address them through our feature decision and creation process. With this information we move to the create phase where we design, initially, paper prototypes to test how users intuitively interact with our first round of features and designs. This helps us find bugs and notice what users respond well to. After finalizing design changes we move on to an interactive dynamic prototype where users will directly interact with the system and then conduct another round of testing. From this we determine the last changes to make before the proposed final design that will be given to the customer in the delivery phase of this cycle.

Due to the limited circumstances of the project's timeline being constrained to a semester as a student assignment, this cycle will only be conducted once. Ideally, this cycle would continue from the hear phase again after receiving customer feedback.



Introduction

The Loss Prevention Resource Council wanted us to come up with a solution to prevent losses related to self-checkout, all while enhancing the user experience. Losses are either intentional or unintentional. Intentional losses occur when an individual intends to steal an item. For example, if an individual scans a cheap shirt and slides an expensive shirt underneath it, that would be an intentional loss. However, an unintentional loss occurs when an individual forgets to scan water bottles at the bottom of their cart.

In short, we need to understand how a typical user uses self-checkout. As well as, their experiences with unintentional and intentional losses. Understanding this will allow us to approach the problem in a manner that would be beneficial to the user who doesn't want to steal in the first place. The user can have the extra reassurance all of their items are accounted for. Through user testing and iterative design practices, we will continuously re-approach the problem to ensure the user is satisfied.

In addition, satisfying the user (the retail customer), will in turn satisfy the request of our client. The client will be able to reduce the monetary loss for their major retail stores, while satisfying the customer who is spending their money at those stores.

Focus Statement

To understand how customers use self-checkout terminals and if there is any unintentional misuse.



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Interviews + Interview Guide

Interview Goals

In order to keep our interviews focused towards the focus statement, we created a list of interview goals. These goals will guide us in our interviews to ensure we gather the data we need.

- Learn when, how and why customers are creating unintentional losses.
- Gather any issues that customers have with the current functionalities of self-checkout terminals, specifically with the scanning/entering of merchandise.
- Understand how the environment around the self-checkout terminals affect the user experience of the customers.
- Learn why customers may prefer a personal cashier and what attributes from their experiences with cashiers can be transferred over to self-checkout terminals.

Interview Questions

Our interview questions consist of three parts. The first part is related to understanding the users background and experience using self-checkout. The second part is intended to be directed at individuals who prefer using self-checkout, so we can focus on improving their experience. The third part is directed at individuals who prefer using a cashier to check-out, to understand what attributes of that experience can possibly be integrated into self-checkout.

General Context

1. How often do you visit department or grocery stores?
 - a. What is your typical reason for visiting?
 - b. Do you normally plan out your visits or are you in a rush most of the time?
 - c. At the end of your shopping do you use the self-checkout terminals or do you prefer a personal cashier? (This should tie in to one of the other two sections below)
 - d. How much time would you say you spend at checkout? Does it take longer with a cashier or when you're using self-checkout?

Self-Checkout

1. Describe the last time you used a self-checkout terminal.
 - a. Could you walk me through your process of using it?
2. How do you feel about the presence of an attendant at self-checkout?
 - a. Describe a time, if any, where the attendant has assisted you during checkout.
3. If an item does not have a barcode, how do you go about inputting it?



-
- a. How do you distinguish between different brands, organic versus non-organic, etc. when manually inputting a good?
 - b. Do have problems manually inputting goods? How often?
4. Recall a time, if any, where a self-checkout kiosk did not perform as you expected (positive or negative).
 - a. What happened?
 - b. Why is it not what you expected?
 - c. If it was negative, what actions did you take for the kiosk to perform the expected task?
 5. Are there any instances where you use a personal cashier over self-checkout? Explain.
 6. When using self-checkout how do you distinguish between goods that have already been accounted for, and those who still need to be scanned?
 7. Some self-checkout kiosks have a camera watching you, how do you feel about this?

Personal Cashier

1. Why do you prefer the cashier over the self-checkout?
2. Describe the last time you used a checkout lane with a cashier.

Recruitment and Conducting Interviews

In regards to recruiting users to interview, we are targeting people that shop at stores that provide self-checkout terminals. These include, Walmart and Home Depot. Due to time and other limitations, we were not able to physically go to the stores to conduct the interview. Therefore, we reached out to students and other individuals, who do shop at those stores on a normal basis. The client did indicate in the project brief that we could use UF students as our user base.

The three of us conducted the interviews in a similar manner to the ones we conducted for project one. We found it essential to have one person solely dedicated to taking notes and another giving the interview. We wanted the interview to be unintimidating, and in-depth to truly capture the users' experience with self-checkout. Therefore, we believed one-on-one interviews were more beneficial than focus groups.

In addition to conducting our own interviews, the client has indicated that they have pre-existing data from their own user research. This data should cover aspects of user research related to *intentional losses*, as it has interviews with convicted shoplifters. Further, it could help us broaden our audience to be more inclusive of all types of shoppers



Interview Results

Interview 1:

General context

1. Once a month
 - a. Groceries and food
 - b. He makes a simple list and thinks of things while he's there
 - c. Prefers self-checkout
 - d. 5 minutes, faster with cashier

Self-checkout

1. Scan each item, sort the items by type, put them in bags and the cart
2. Fine, makes sense
 - a. The terminal bugs out, or when he has a couple items and they check him out instantly
3. Search for it, usually produce
 - a. Look for the item number
 - b. If it doesn't have item number, ask attendant
 - c. Never have problems manually inputting goods
4. When he clicked pay, the card reader froze and he needed an attendant to help
 - a. Was not expected because usually it doesn't freeze
5. When there isn't a self-checkout option
6. Usually bag items he scans and the self-checkout makes you bag your items
7. Fine, makes sense to prevent theft

Personal cashier

1. He doesn't
2. CVS, cashier was pretty helpful and told him about discounts available

Interview 2

General context

1. Once every 2 weeks
 - a. Getting groceries
 - b. Usually she plans out her visits and makes a list of what to get
 - c. Usually self-checkout terminals
 - d. Probably 5 mins, takes longer using self-checkout

Self-checkout

1. Target, Took out her items from the cart and scanned each item. Then put the scanned items into plastic bags and put the bags into the cart. Then, paid
2. Doesn't really matter
 - a. When she wanted to take an item out from her cart and it needed the attendant's assistant
3. She puts it on the scanning thing and goes to the search item menu and type in the food item



-
- a. Don't have any problems
 - 4. Usually it performs as expected
 - 5. When she feels that the line is shorter, or when she has a lot of produce in plastic bags so she doesn't need to manually input every item
 - 6. She uses plastic bags after scanning her items and usually puts them into her cart right after
 - 7. Doesn't bother her

Personal Cashier

- 1. Only when she has to manually input a lot of items
- 2. Publix, the line was shorter and only had a few items

Interview 3

General Context

- 1. Once every two weeks
 - a. I need to buy groceries or personal care items
 - b. Usually decide to go on a whim, but I decide to go when I need something in particular
 - c. I prefer to use self-checkout
 - d. Its a pretty quick process. Feels quicker at self-checkout.

Self-Checkout

- 1. Describe the last time you used a self-checkout terminal.
 - a. It was pretty easy. Pretty minimal manual touch points. There was someone making sure you're not stealing something.
- 2. It's supposed to not feel good. They're supposed to make sure you're not stealing. They're supposed to scare you.
 - a. One time I was trying to buy fireworks (poppers), and apparently you need to be 18 or older to purchase those. So the attendant had to come over and confirm that I was 18 in order for me to proceed. In this instance, it was unnecessary for what I was buying. But if it was cigarettes I would prefer if my kids couldn't just go buy them at self checkout.
- 3. I'm honestly not sure. I think they have a search bar? And then you put it on the scale. Thinking about it would be pretty easy to put something light on the scale when manually inputting.
 - a. I think the names are different or something.
 - b. They have it pretty laid out to be honest.
- 4. No it usually does what I expect.
- 5. I usually always go the self-checkout route. However, if I have a lot of items I usually go personal cashier because it easier for me to just put everything on a conveyor belt and have them handle it.



6. Those that are scanned are bagged on the lower metal portion. Those that still need to be scanned are in the cart.
7. It's understandable. They don't really bother me at all .

Interview 4

General Context

1. About once a week.
 - a. Usually to get food
 - b. Mostly a rush, I don't really go with a list or anything.
 - c. I prefer self-checkout, but places like Publix don't have them.
 - d. I think the longest I have ever spent was like 10 minutes, but it's usually less than 5 mins. I think self-checkout is shorter.

Self-Checkout

1. Describe the last time you used a self-checkout terminal.
 - a. I think it was at Target about a week ago. I walked up to self-checkout with only like 3 items or so. Scanned and bagged them one at a time.
2. Attendant's kind of make me uncomfortable. Even though I'm not stealing, they make me feel like I am doing something wrong.
 - a. I remember one time I accidentally scanned something twice and I clicked the delete button. For some reason, I couldn't delete without the attendant putting in her code. So I had to wait for her to do that.
3. I think there's a look up feature.
 - a. Sometimes I have a hard time telling. Especially if the fruit doesn't have a sticker. I may have accidentally picked up organic or non-organic.
 - b. Yeah, usually I can't tell what the exact item is so sometimes I guess.
4. Recall a time, if any, where a self-checkout kiosk did not perform as you expected (positive or negative).
 - a. Basically the only thing I can think of is the one time with the delete I talked about a second ago.
 - b. Because it wasted so much time on my end. Just seemed like an unnecessary feature.
 - c. I called the attendant over.
5. Actually, I tend to avoid self-checkout if I'm buying fruits or non-scannable items.
6. I usually keep items that I haven't scanned in my cart, and those scanned in the bags to the right.
7. Pretty uncomfortable.



Personal Cashier

1. Sometimes I prefer cashiers if I have a lot of items.
2. I think it was at publix. Pretty sure I just put my items on the conveyor belt and they scanned and bagged everything.

Interview 5

General Context

1. Once or twice a week.
 - a. groceries & dinner
 - b. Rush
 - c. I don't really have a preference. I usually just go with whichever has a shorter line.
 - d. A couple of minutes

Self-Checkout

1. Describe the last time you used a self-checkout terminal.
 - a. I went to walmart yesterday and used self-checkout because I was only buying a couple of items. I think I just waited in line, saw the thing turn green, walked up, scanned my items, bagged my items, and then checked out.
2. I don't really mind attendants.
 - a. I don't think I have ever purchased alcohol from self-checkout, but I'm pretty sure that's an instance they would assist me.
3. Never have purchased a non-barcoded item from self-checkout. I think you just search for it though.
4. Sometimes a thing pop's up where it says weight is not what it expected.
 - a. ^^^
 - b. Because I didn't do anything wrong. It should have matched because I just scanned it.
 - c. I can't remember if it just went away. Or if the light turned red and someone dismissed it.
5. If im buying a lot of items I use personal cashier because I feel self-checkout should only be if you're in a rush.
6. Everything that's done is on the metal thing.
7. Not bothered by the camera.

Personal Cashier

1. No preference.
2. I just put my items on, and they did everything for me.



Affinity Diagram



User Needs

From our interviews and affinity diagramming we discovered three key user needs. Users mentioned they were persuaded by short lines and fastness, hence user need 1. Another key theme we found was that users were frustrated with the manual input process revolving around self-checkout, which resulted in user need 2. Finally, a third prominent theme we discovered was

1. The user needs a faster way to use self-checkout, specifically when it comes to non-barcoded goods.
2. The user needs to be guided throughout the process of manually inputting items.
3. The user needs to be held accountable for items they have not rung up yet.



Personas

Primary Persona

An individual who is familiar with and prefers self-checkout.



Educational Background: College Student
Computer Skills: Advanced
Familiarity: Frequent User
Attitudes: Introverted – avoids having to communicate with others

Ben Adams

"It's 2019, having cameras everywhere is normal. It benefits the companies and protects their assets"

Key Goals

Ben wants to get in and out of the grocery store as quick as possible. Being an introvert, he wants the process to be void of human interaction. If purchasing goods without a barcode he wants the ring-up process to be seamless.

Day in the Life

Every Monday, Ben makes his weekly trip to Walmart to restock on his fresh produce and other goods. Once he gathers his items, he heads to checkout. He opts for self-checkout because he does not want to deal with a cashier. Once at self-checkout Ben quickly scans his items that have barcodes.

Ben becomes frustrated that he must manually input items that do not have a barcode. He slowly types in the items name, and then is left to decide exactly which variant he picked up. Ben now must ask the attendant for assistance in identifying the item.

Ben just wishes there was a way to quickly checkout, without the aid of an individual

Secondary Persona

An individual who only uses self-checkout when there are long lines. Not technologically savvy, prefers checking out with a cashier.



Education: High School Diploma
Computer Skills: Novice
Familiarity: Hardly uses
Attitudes: Friendly – enjoys communicating with people

Mark Daniels

"They have workers that scan the items, why would I do their job for them?"

Key Goals

Ben only uses self-checkout when he is in a rush. As he doesn't have much technical experience, he wants the process to be intuitive and efficient.

Day in the Life

Sometimes Mark needs to head to the store after work in order to pick up an item or two for dinner. During rush-hour, the store tends to be packed, and the lines are long. Therefore, Mark opts to use self-checkout since he only has one item.

When he goes up to the machine, Mark is unsure of how to find his exact tomato in his hand. The process seems difficult to him. After receiving help from the assistant, Mark goes to checkout. He was so side-tracked by inputting the tomato, he forgot to ring up his box of spaghetti. Mark did not intend to steal the spaghetti.

He wishes the process for manual checkout was easier, while reminding him about other items he has in certain situations.



Scenarios

Primary: Technical User - Ben

Ben is a college student with technical skills who general prefers avoiding interaction with other people and having a quick shopping experience due to his busy schedule, but often accidentally leaves items in his cart that leads to unintentional loss to the stores. One morning, as he looks through the refrigerator, he notices he is running low on food and begins to takes notes on his iPhone of what to purchase for future meals. After finishing his classes that afternoon, Ben decides to go to the grocery store to make his purchases. At the grocery store, he goes through his list and gathers his items in his shopping cart. He then approaches the self-checkout terminals. He begins scans each item and proceeds to put the scanned item into the provided plastic bags. When Ben attempts to pay and complete his transaction, he is prompted with a screen with a friendly warning that he may have forgotten an item in his cart. Ben realizes his mistake and scans the final item, completing his transaction. Ben promptly leaves with all his items, satisfied and with one less worry on this busy schedule.

Secondary: Non-technical User - Mark

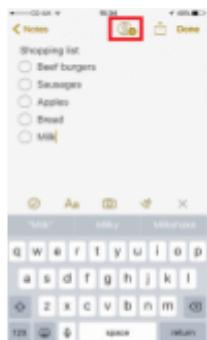
Mark is a non-technical user, who prefers to use personal cashiers as he doesn't mind communicating with people. He likes his shopping experiences to not require much effort from him and to be intuitive. One evening Mark realized he forgot to buy tomatoes for his pasta dish, he quickly runs to the store to pick them up. On his way to checkout he notices the cashier lines are long, while the self-checkout lines have no wait. Since he only has one item, he begrudgingly decides to head over to the self-checkout machines. He notices there isn't a way to scan the vegetable, so he uses the "Detect Item" search feature. The search guides Mark through an assortment of tomatoes. Helping him distinguish if it's organic, non-organic or a specific brand by pictures that represent the brand sticker and the place in the store he picked it up from. Mark is easily able to tell which brand he picked up, and is able to quickly finish his transaction. Mark leaves the store both satisfied with his shopping experience and more inclined to use self-checkout units next time he comes back.



Storyboard



After classes on Friday, Ben decides to go to the grocery store because he was running out of food.



As he looks through the refrigerator, he takes notes on his iPhone of what to purchase for future meals.



Once he gets to the grocery store, he goes through his list and gathers all the items.



Ben notices the camera but isn't bothered by it.



He scans each item and proceeds to put the scanned item into the provided plastic bags.



He then approaches the self-checkout terminals and presses start.

Wireframes

Metadata

Designer's Name: Samantha Su, Ariel Coulson, Gabriel Perez

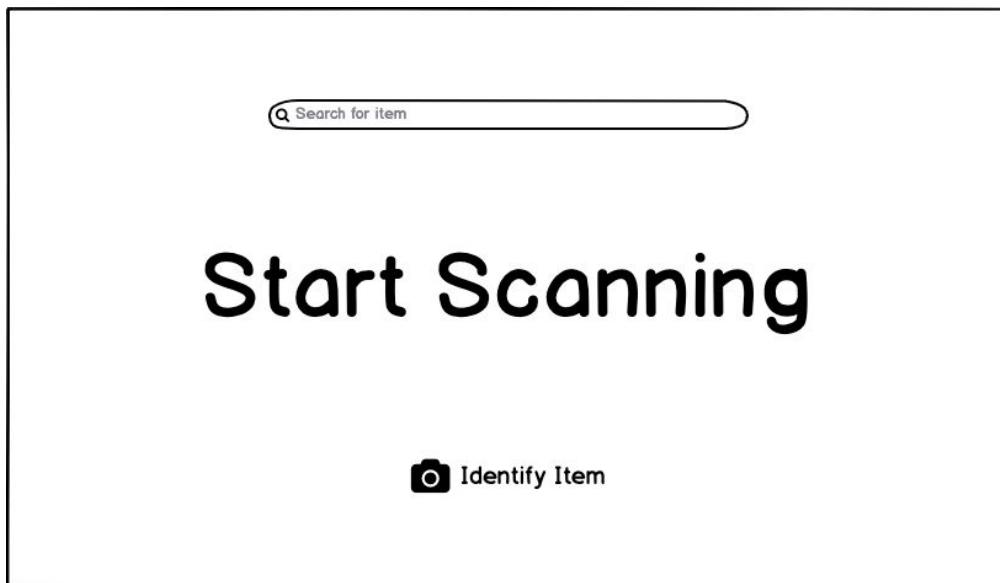
Date Created: 11/08/19

Date Last Revised: 11/20/19

Version #: 2.0

Changes: When using the search feature, the initial design required three screen, they have been reduced to only two.

Start Screen

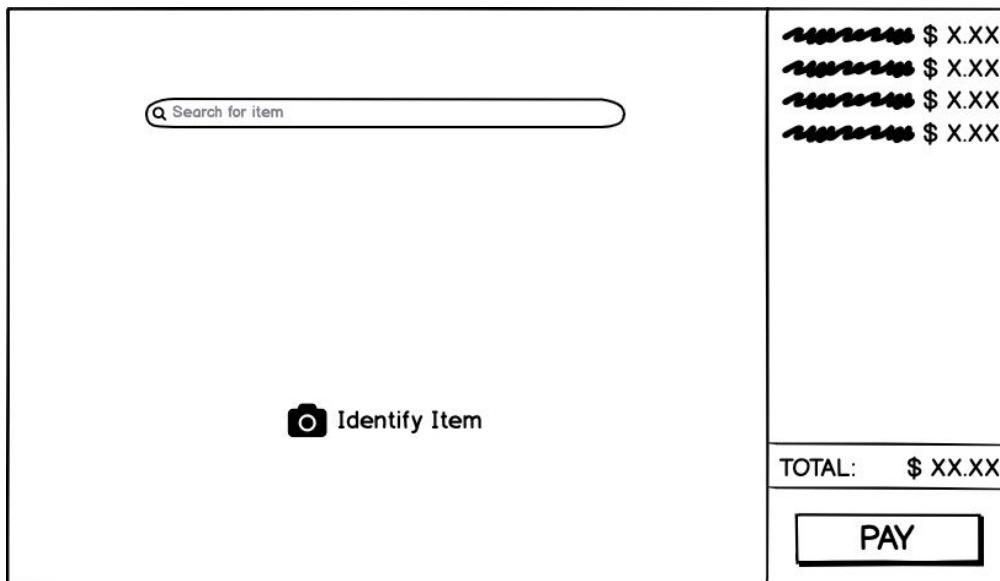


Initial greeting screen where a customer can begin scanning their items or choose to manually search items through the search bar feature or using the camera to identify their item.



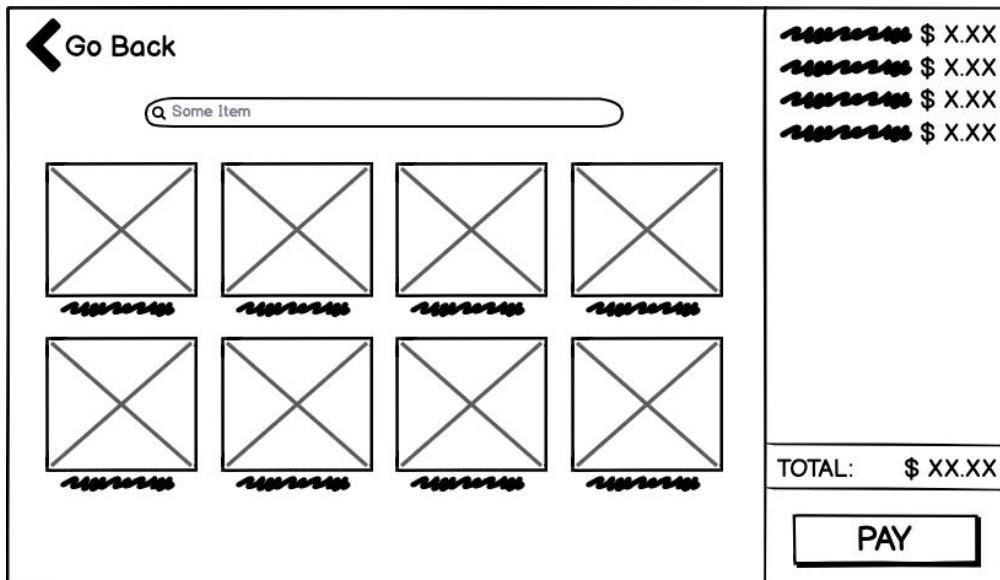
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Main Screen



Main screen - displaying the scanned items on the left and still providing the two item search functionalities. The 'PAY' button will begin the payment process and prompt the user to select their payment method.

Search Result Screen

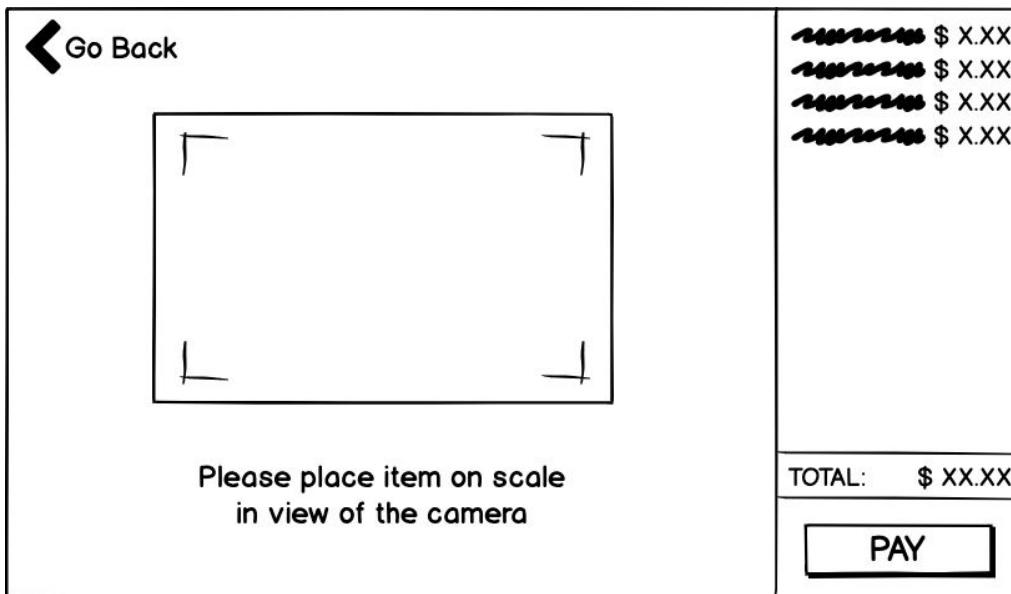


Search result screen - displaying the list of items related to the search input given by the user in the search bar. It also serves as the result screen for the camera item detection.



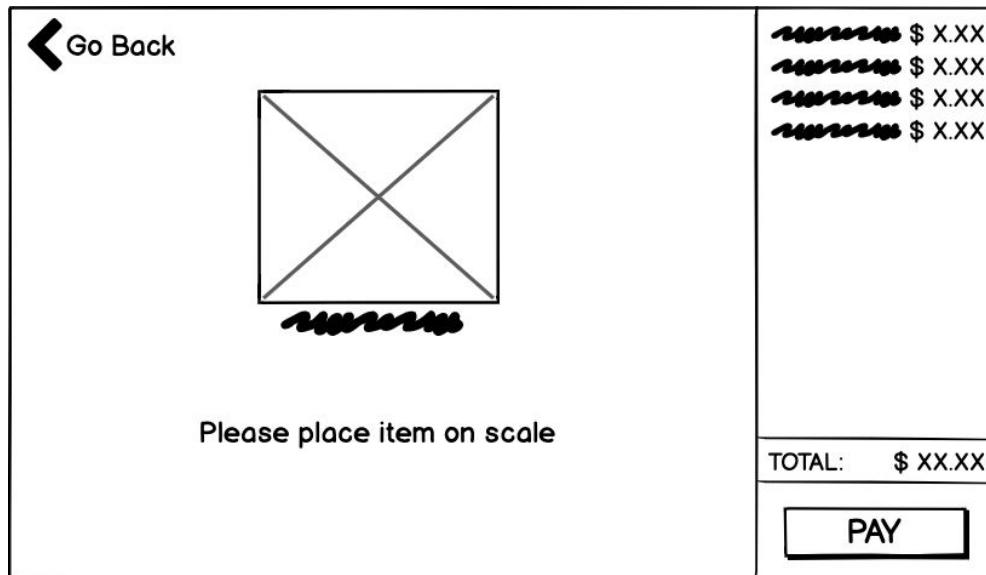
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Item Detection Screen



Item identification screen - the center block represents the view of the camera so that the user may position the item within the threshold. The screen would display messages such as "Identifying..." or "Identified!".

Scale Screen



Item weight check screen - for items that need to be manually inputted, this screen indicates that it is time to weigh that item. If the user clicks 'Go Back,' then it will take them to the previous selection screen. If the user clicks 'Pay,' they will proceed to checkout.

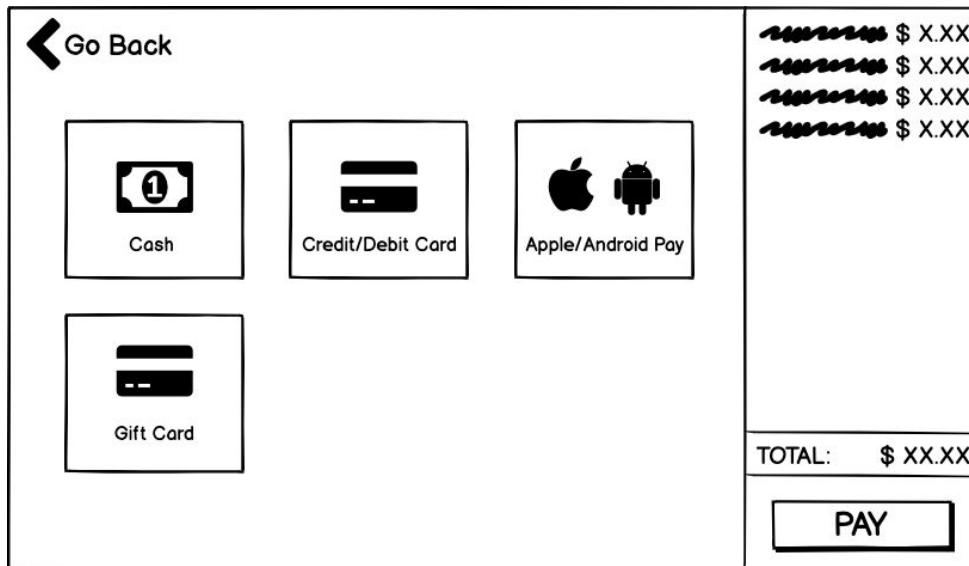


Warning Screen



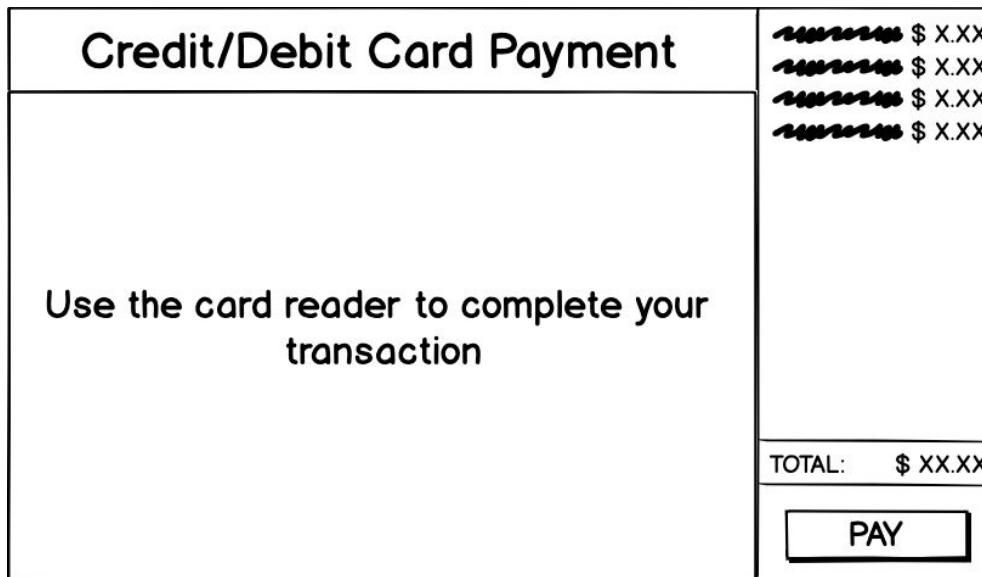
When the user goes to 'Pay,' but still has items in their cart, the self-checkout will issue a warning that items have not been accounted for. The user can then 'call attendant' for help, and the attendant will handle the issue. On the other hand, the user could click 'ok', taking them back to the home screen to correct their issue.

Payment Screen

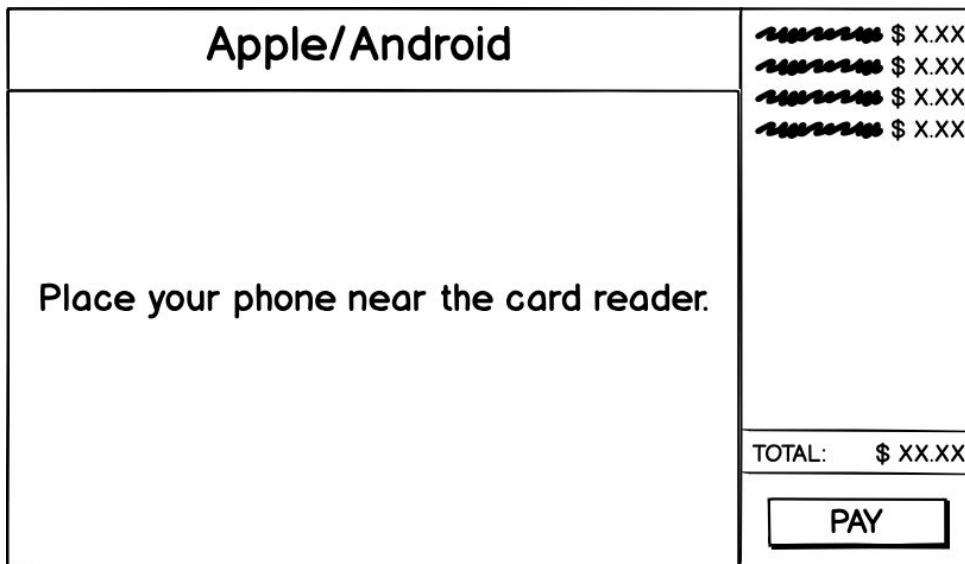


The user has clicked 'pay' and is able to choose which payment type they would like to select. The total is still displayed on the right, or they could go back to the home page. Each payment type will lead to the payment type specific landing page.



Card Payment Screen

Credit/Debit card payment screen - provides instructions for users to pay using credit or debit cards.

Phone Pay Screen

Apple/Android payment screen - provides instructions for users to pay using Apple or Android pay



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Cash Payment Screen

Cash Payment	
Insert cash into the slot	
	\$ X.XX \$ X.XX \$ X.XX \$ X.XX
TOTAL: \$ XX.XX	
PAY	

Generalized information regarding the cash the machine is expecting to be inputted.

End Screen

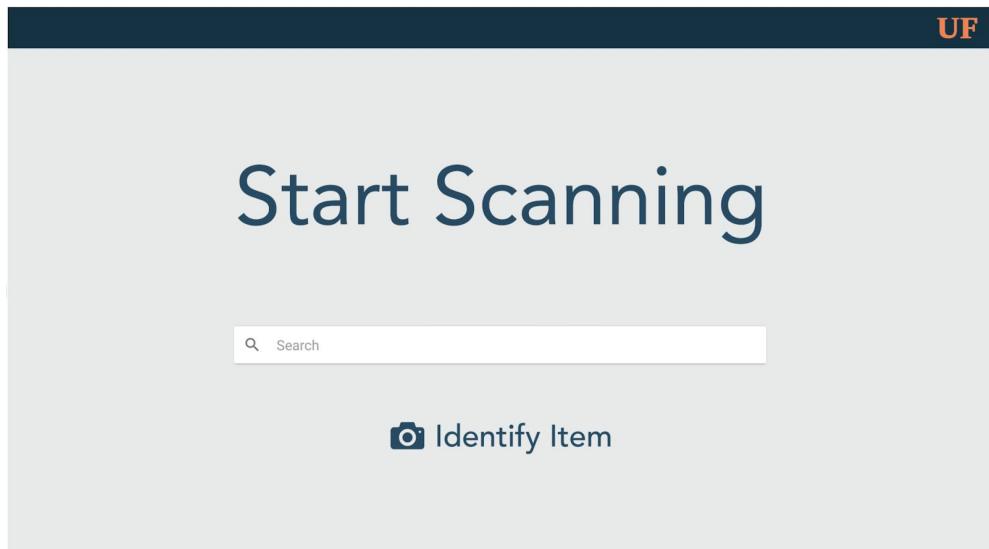
Final thank you screen that will automatically cycle to the 'Start Scanning' screen after a couple of seconds.



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Mockups - Mapped to User Needs

Start Screen



Version 2: After the paper prototype tests, it was brought to our attention that the search bar was not on the start screen. Satisfies the user need for faster self-checkout. We added an identify item feature on the home page, so users can quickly checkout. The identify item feature also guides the user through self checkout. Therefore, covering user needs 1 and 2.

Search Result Screen

A screenshot of a mobile application interface showing search results for "Onion". At the top left is a "go back" arrow. A search bar contains the text "Onion". Below the search bar are four product cards: "Red Onion \$0.98/lb", "White On... \$0.63/lb", "Yellow O... \$0.78/lb", and "Red Onion \$0.97/lb". To the right of the cards is a vertical column with the text "Total: \$ 0.00" and a large blue "PAY" button.



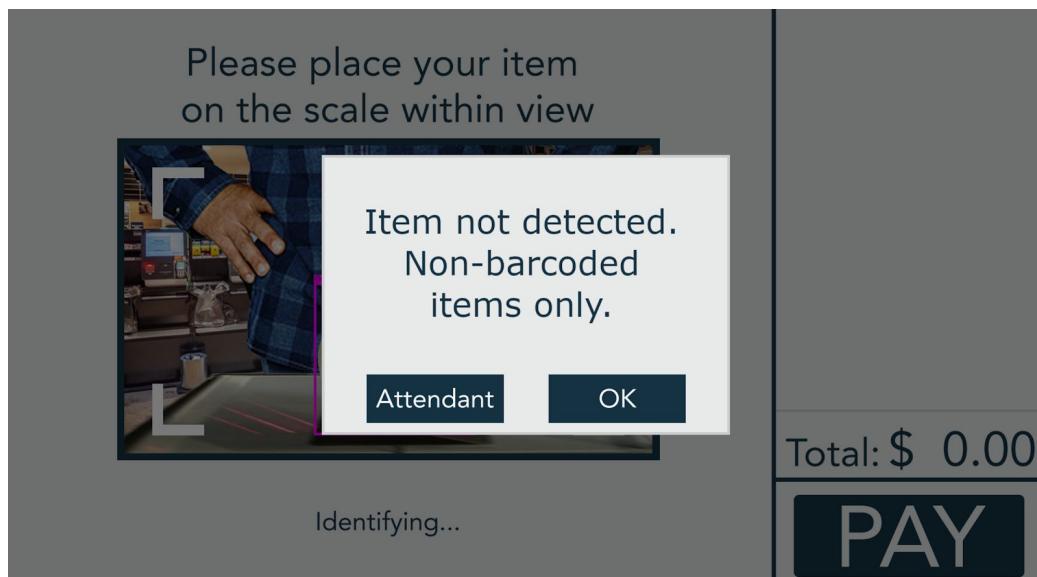
Version 1: The search screen never changes throughout our design process. User need is satisfied by guiding the user through pictures in the manual process.

Item Identification Screen



Version 1: Identify item screen is able to use a photo to identify an item. However, we did not consider the possible consequences surrounding this. Users may try to detect an item that has a barcode. User need for guided manual input and fast checkout accounted for.

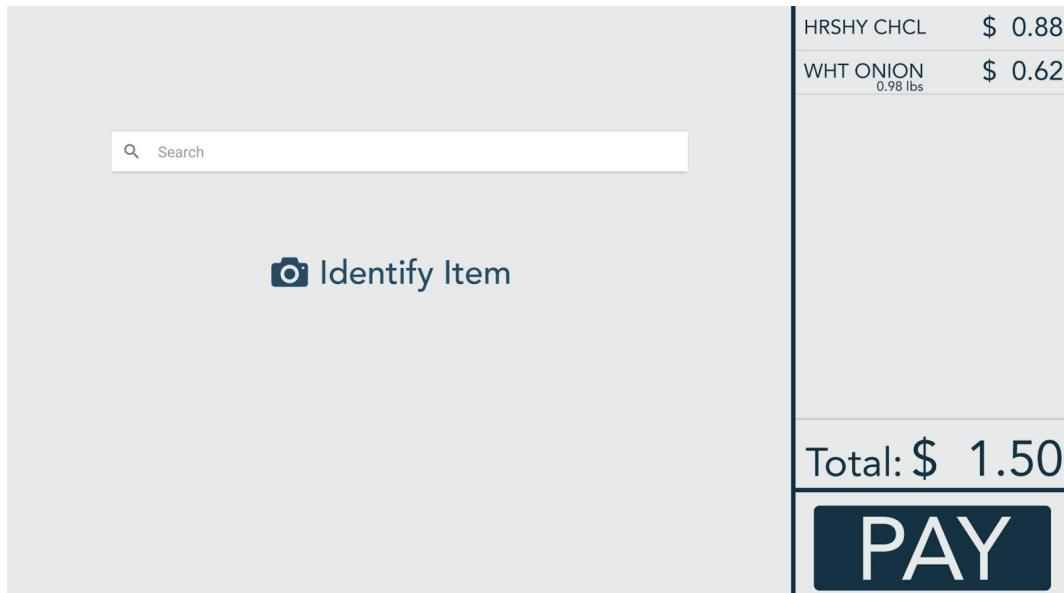
Non-barcode Warning Screen



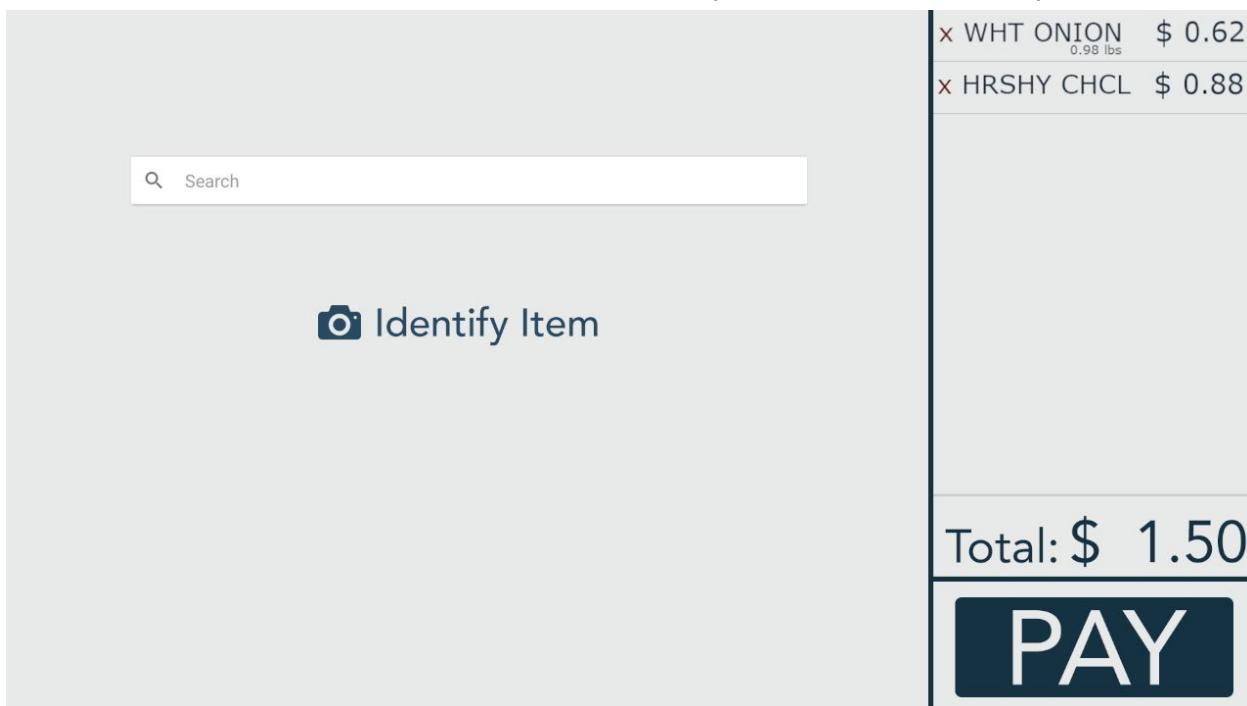
Version 1.1 published December 2, 2019

Version 3: We kept the ‘item detection’ interface the same. However, we added a warning screen. This informs the user that they are trying to detect an item that is not barcoded. If the user remains confused, they can call the attendant over, or proceed back to the main page.

Main Screen



Version 1 - After Dynamic Prototyping it was brought to our attention that the user could not delete an item. Therefore, we included that feature, only if the user was not in pay mode.



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Version 1.1 published December 2, 2019

Version 3 - You can see we added a delete button next to the product name. This was revealed to be a problem during our dynamic prototyping. Now users are able to easily delete an item. Using consistency we added an 'x' button, so the user knows they can click it to remove an item.

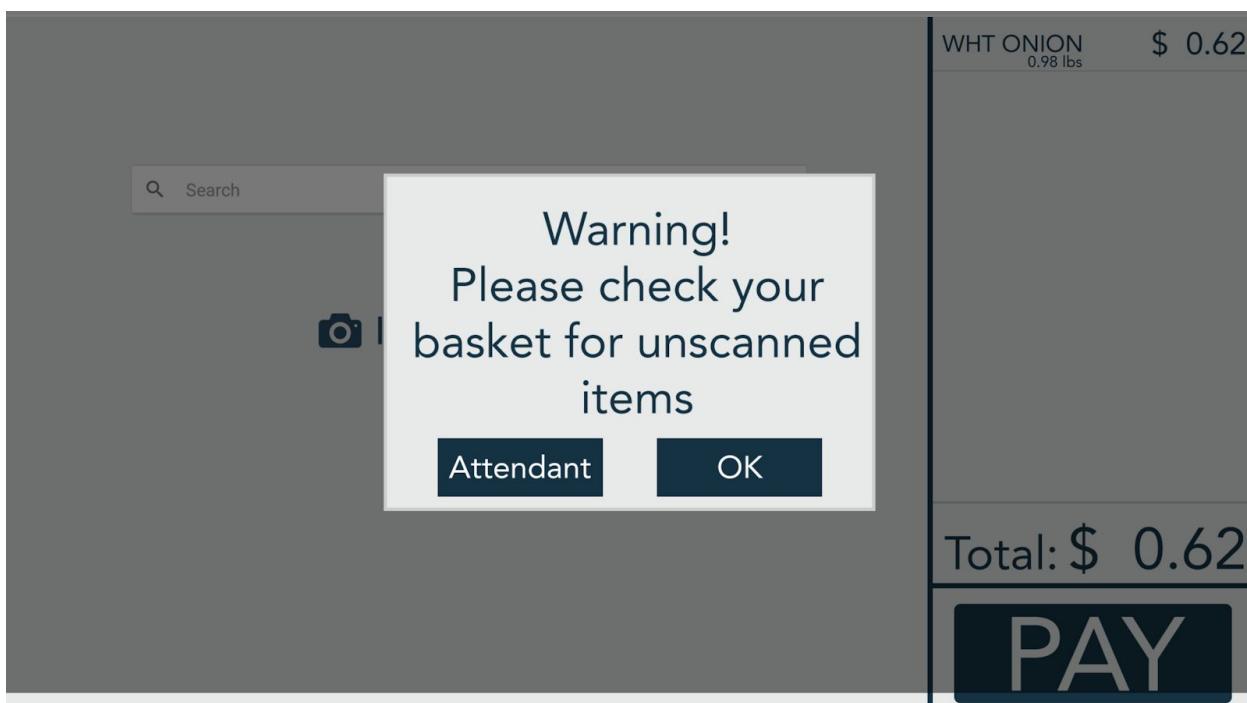
The screenshot shows a mobile-style interface for selecting a payment method. At the top left is a "go back" button. The main title is "Select Payment Method". Below the title are four payment options: "Cash" (cash icon), "Credit/Debit Card" (credit card icon), "Android/Apple Pay" (phone icon), and "Gift Card" (gift card icon). To the right of the payment options is a summary table with two items:

WHT ONION 0.98 lbs	\$ 0.62
HRSHY CHCL	\$ 0.88
<hr/>	
Total: \$ 1.50	
PAY	

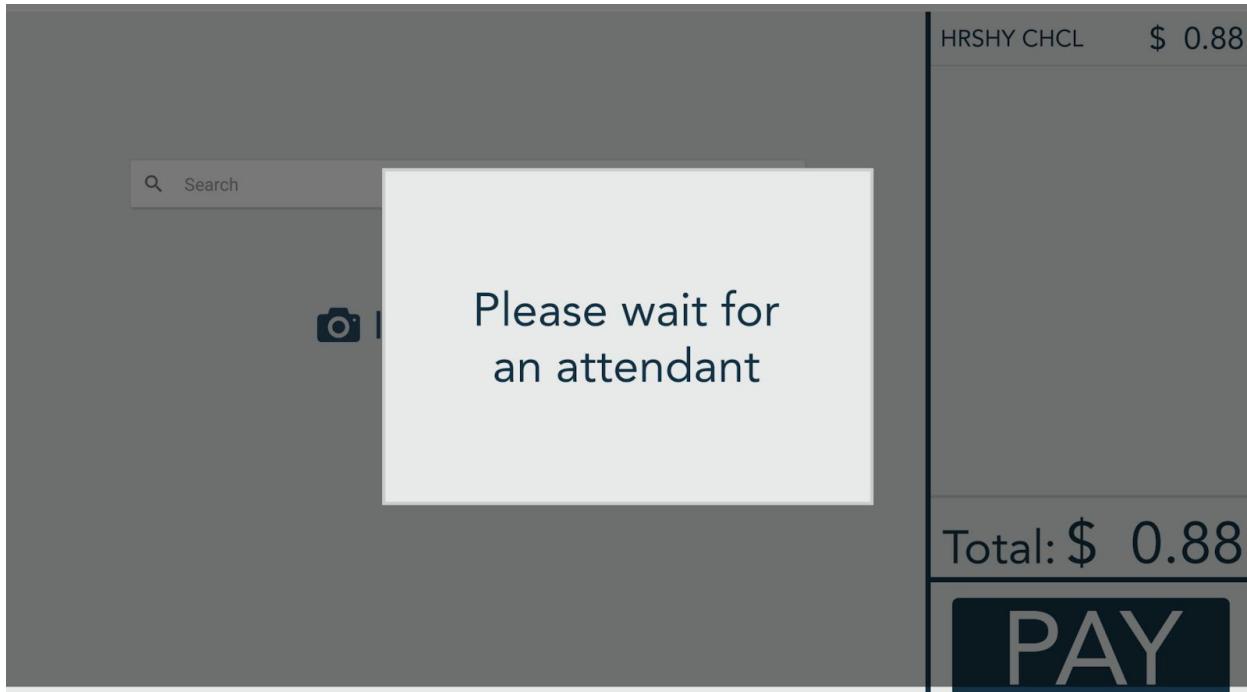
Version 1: The payment page remains the same throughout the design. We used the interaction principle of metaphors, so the user can now click a picture of money will direct them to pay with cash.

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Version 1.1 published December 2, 2019



Version 1: There is a warning that the individual tried checking out without accounting for all items in the bag.



Version 2: After it was brought to our attention in the paper prototype tests, we added a waiting indicator for the attendant. This is because the user could not detect the state of the system.

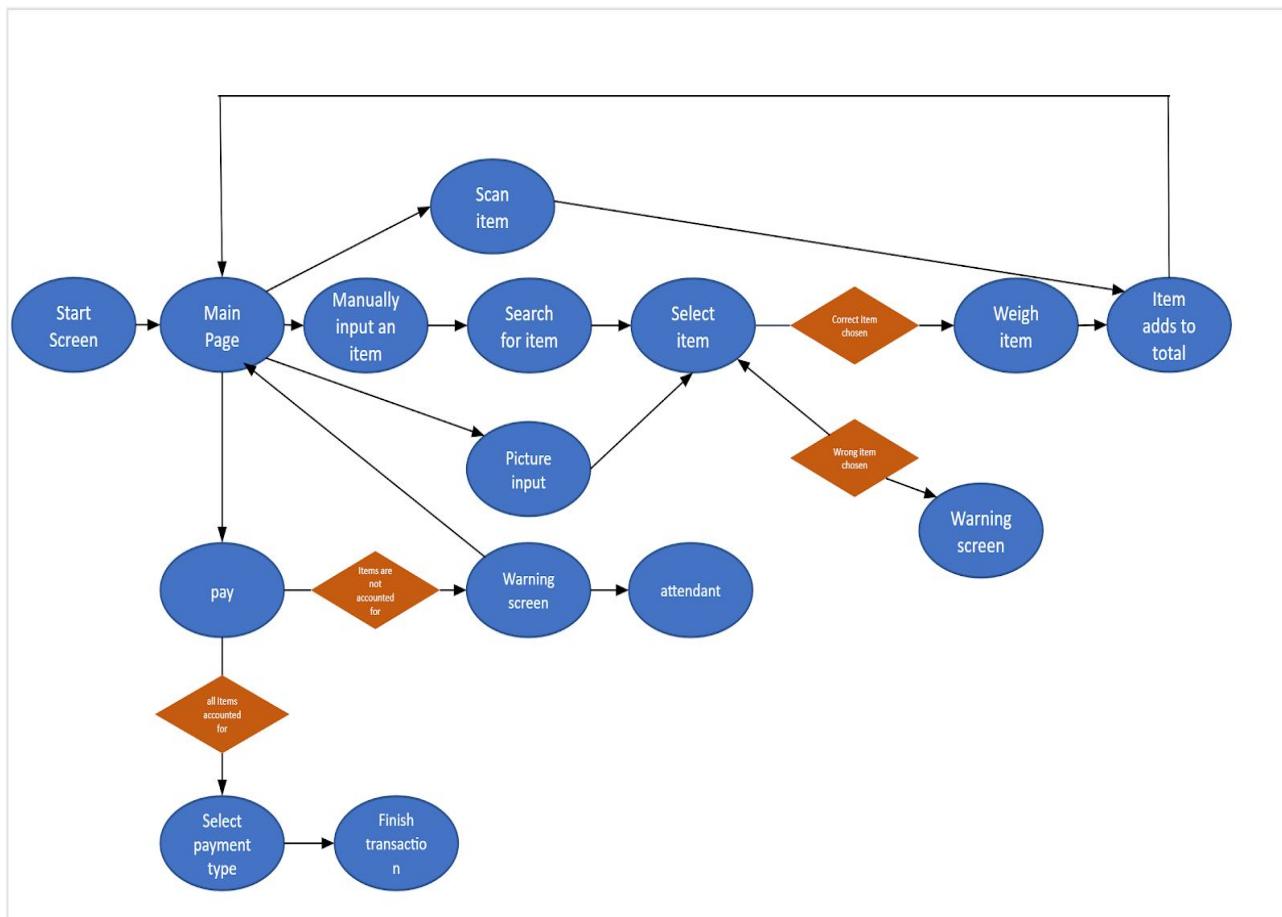


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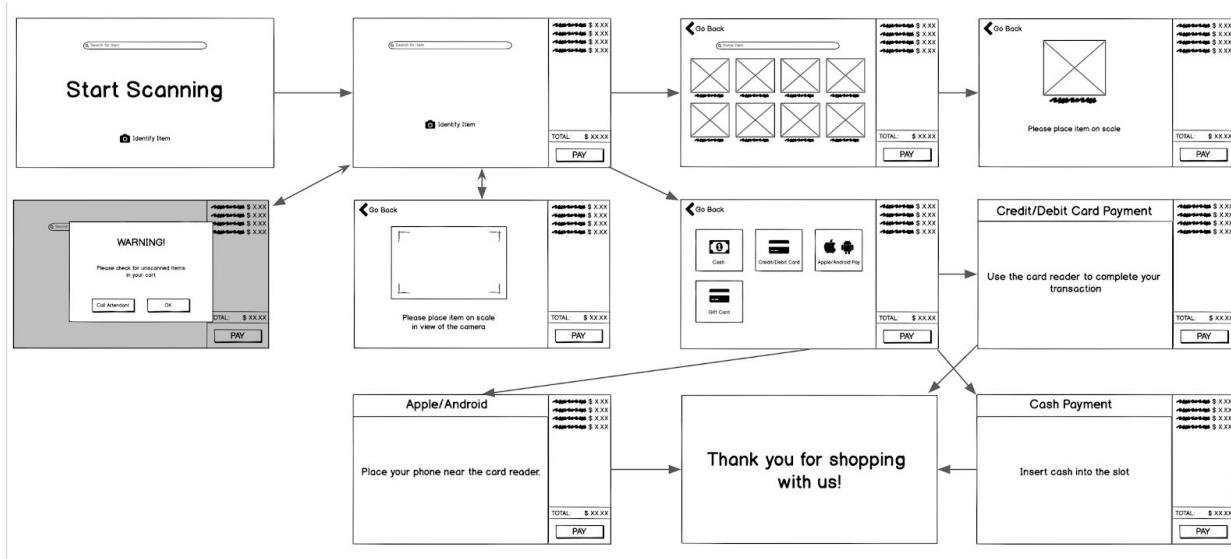


Flow Diagrams

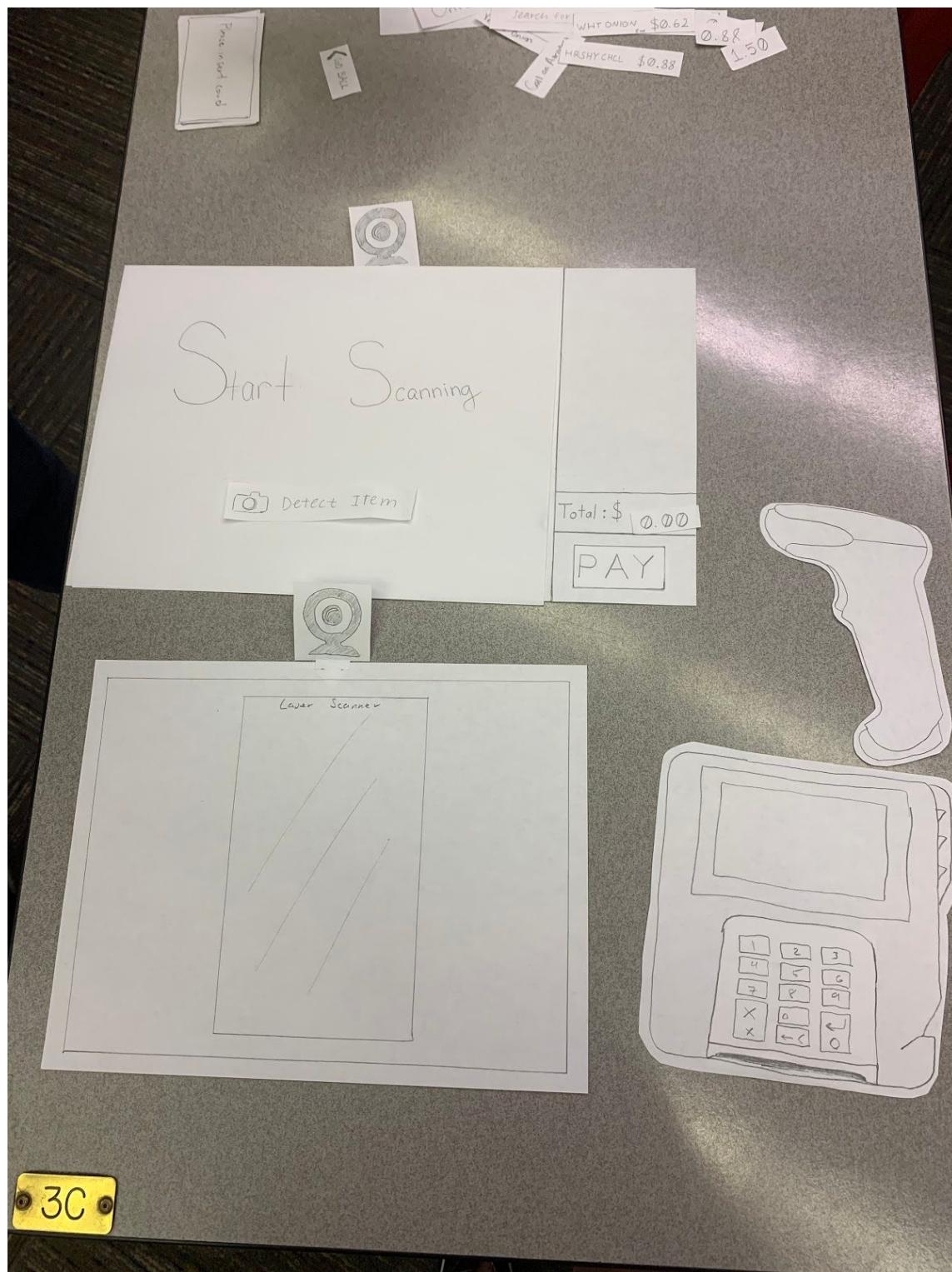
Task Flow Diagram



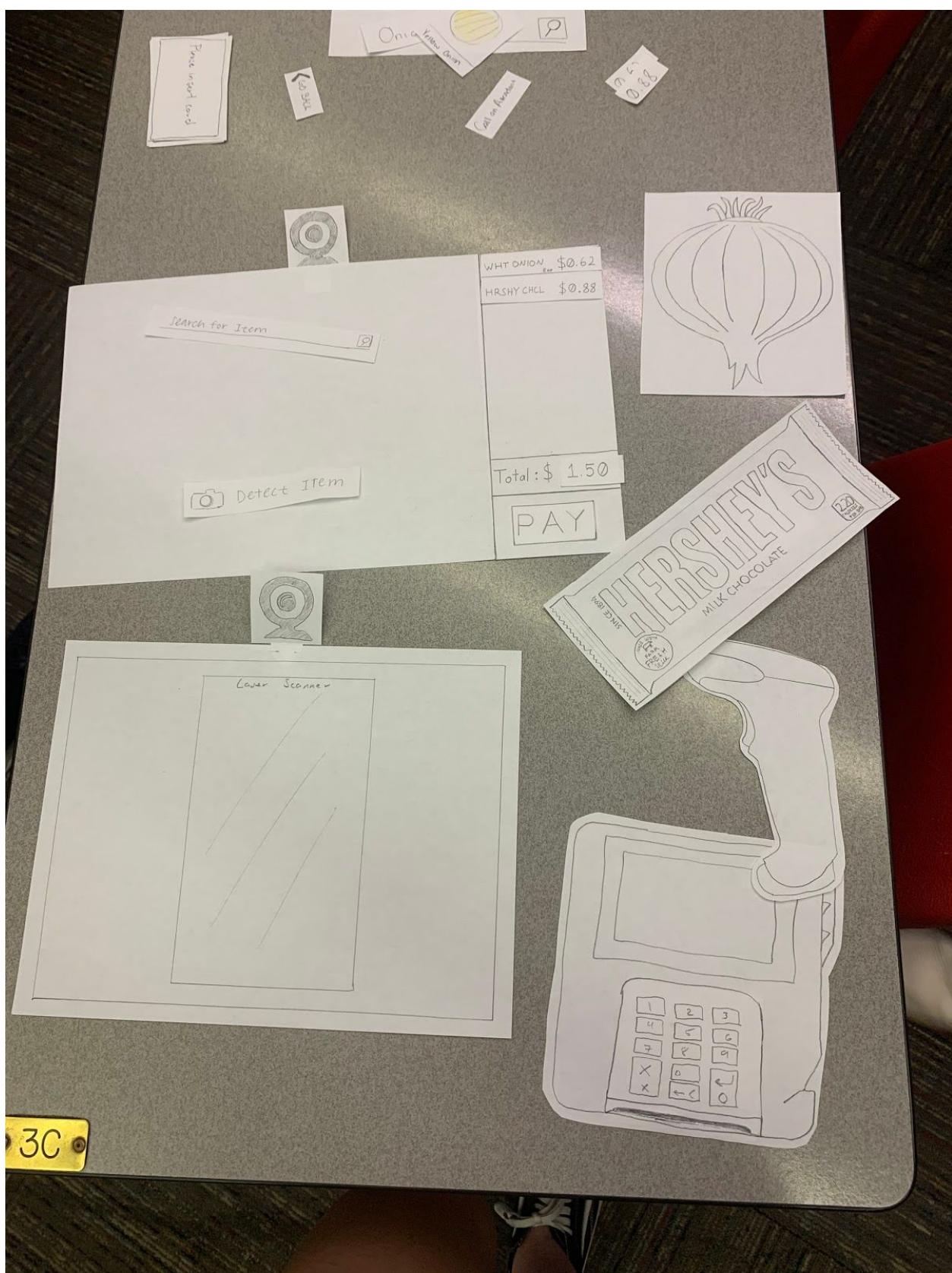
Wireframe Flow Diagram



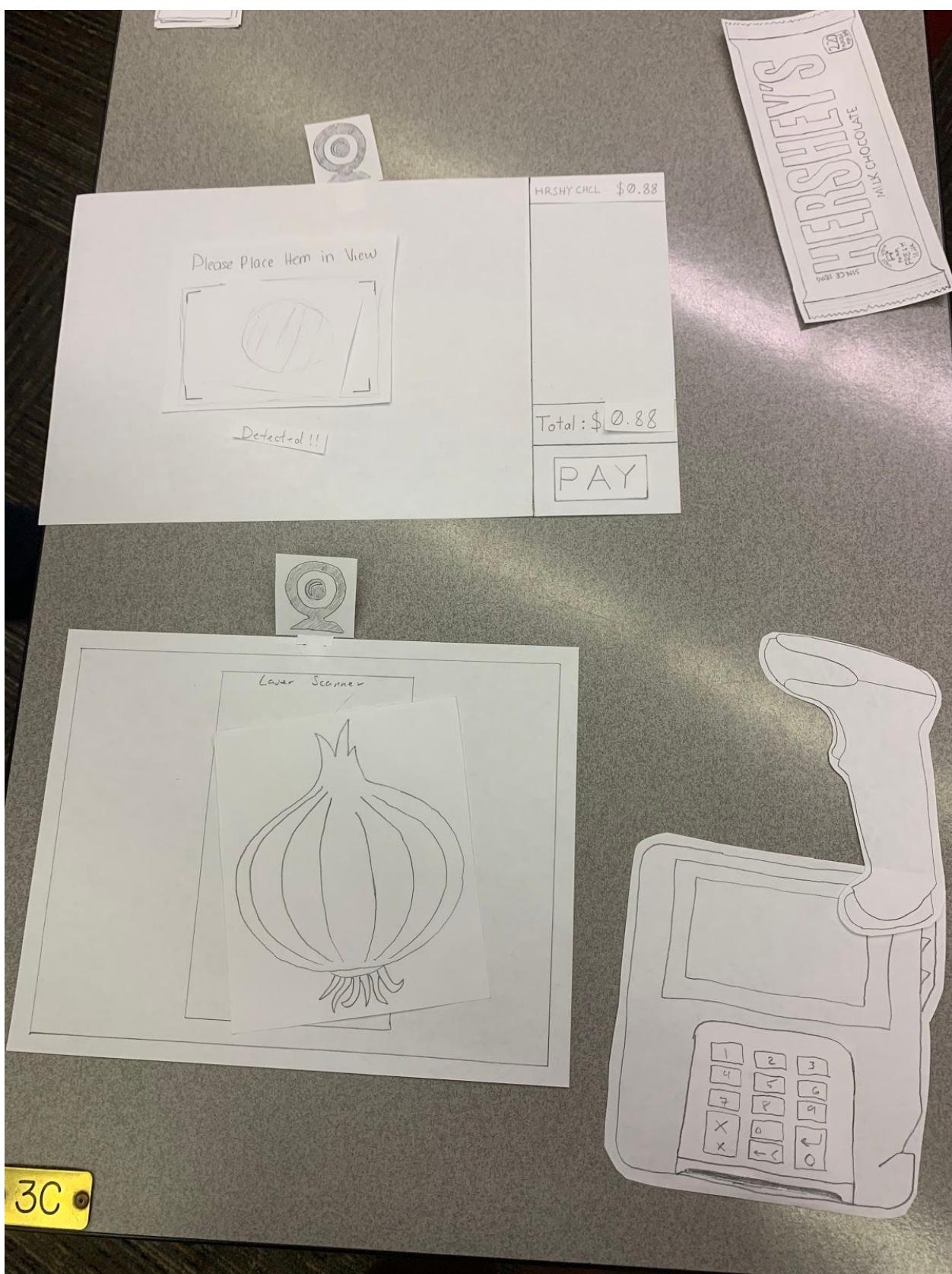
Paper Prototype



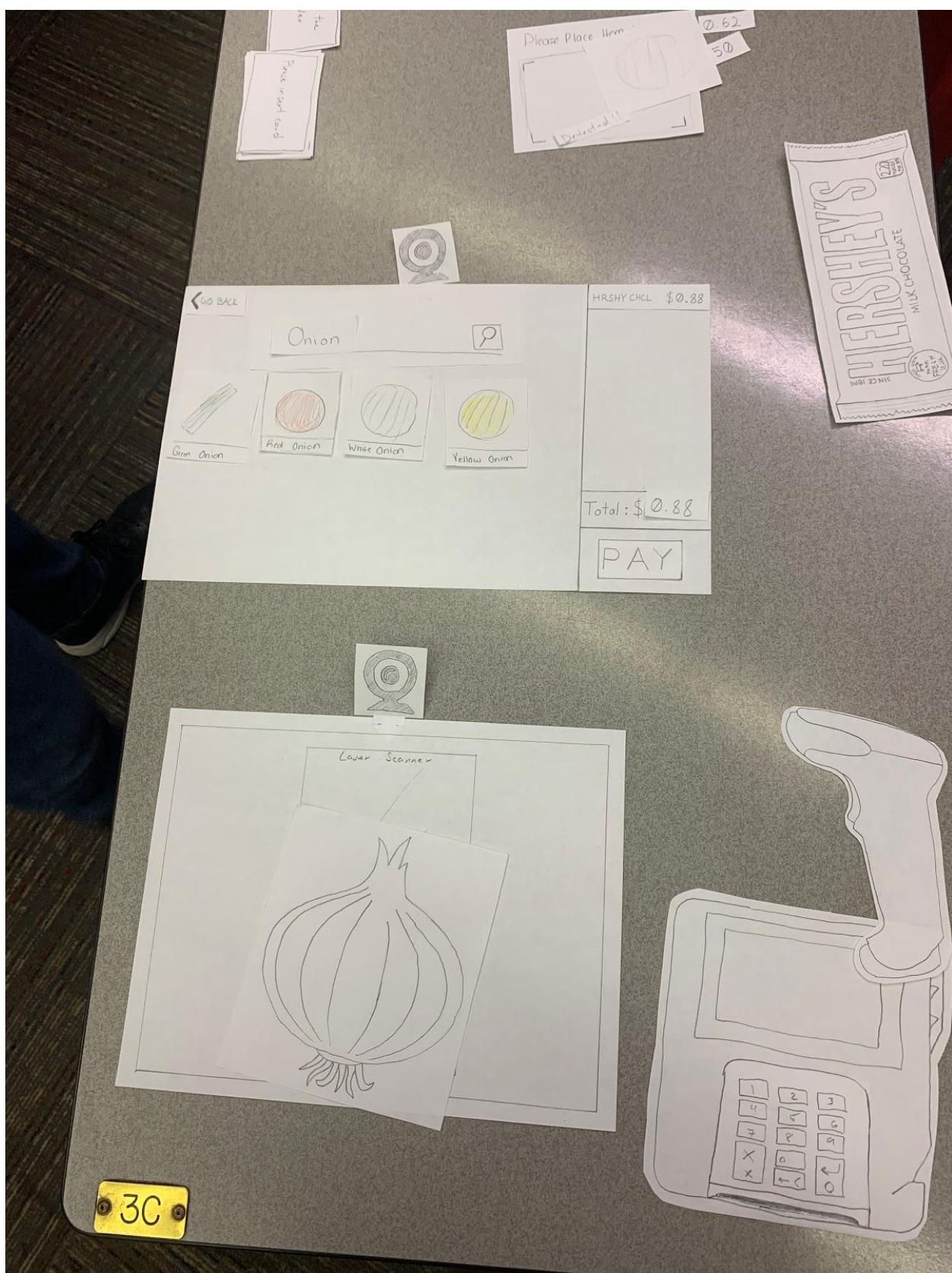
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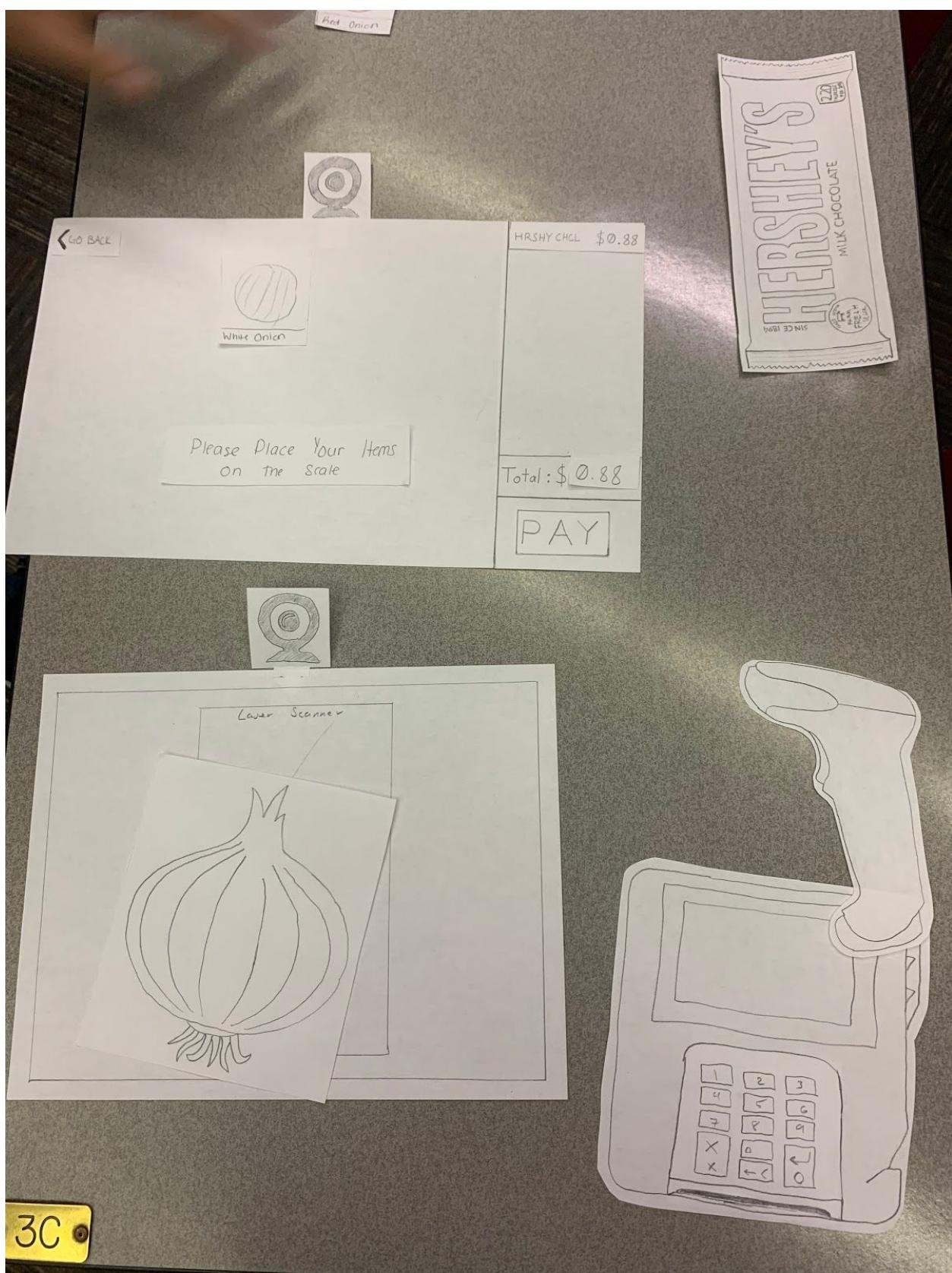
Version 1.1 published December 2, 2019

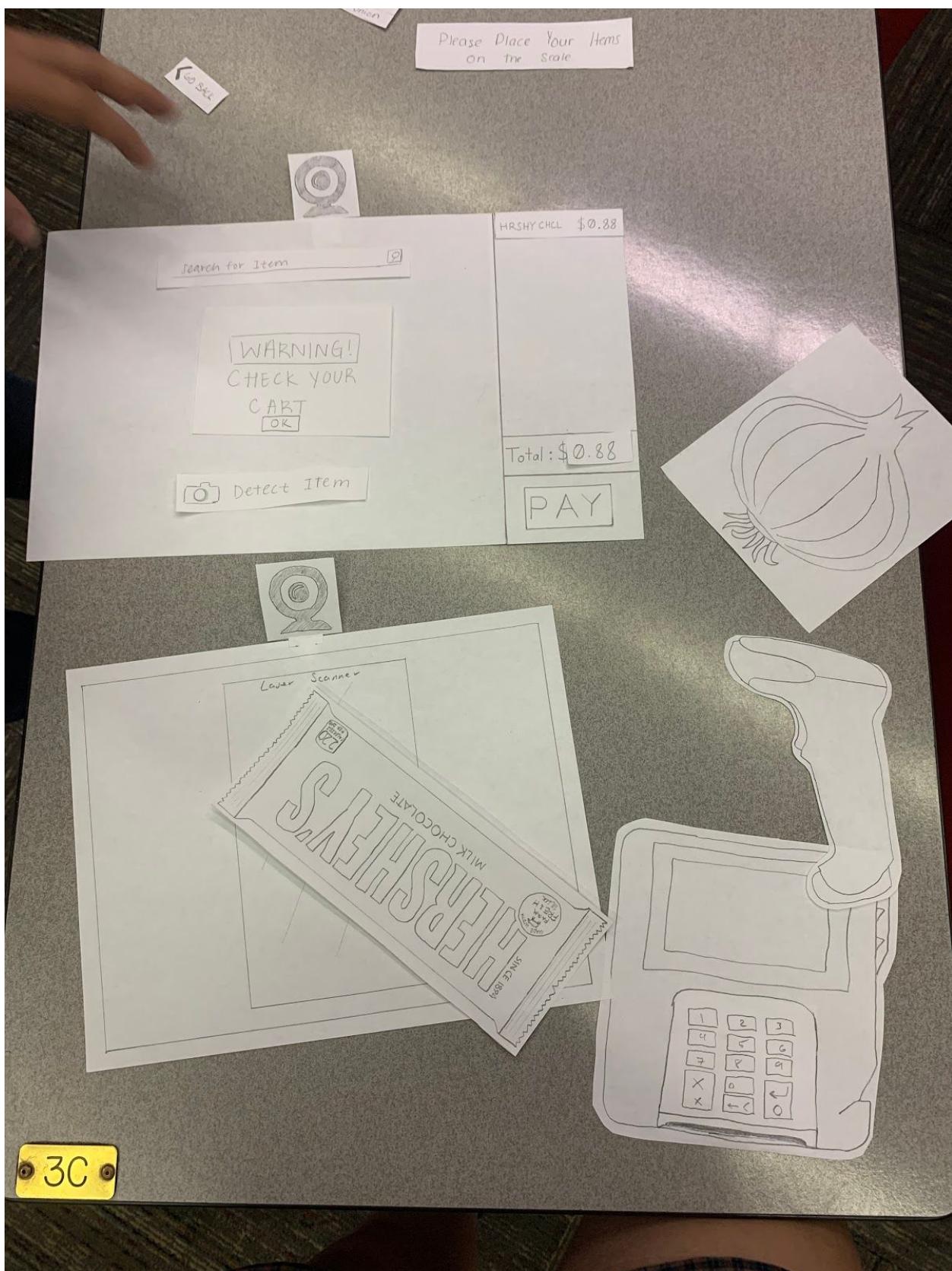
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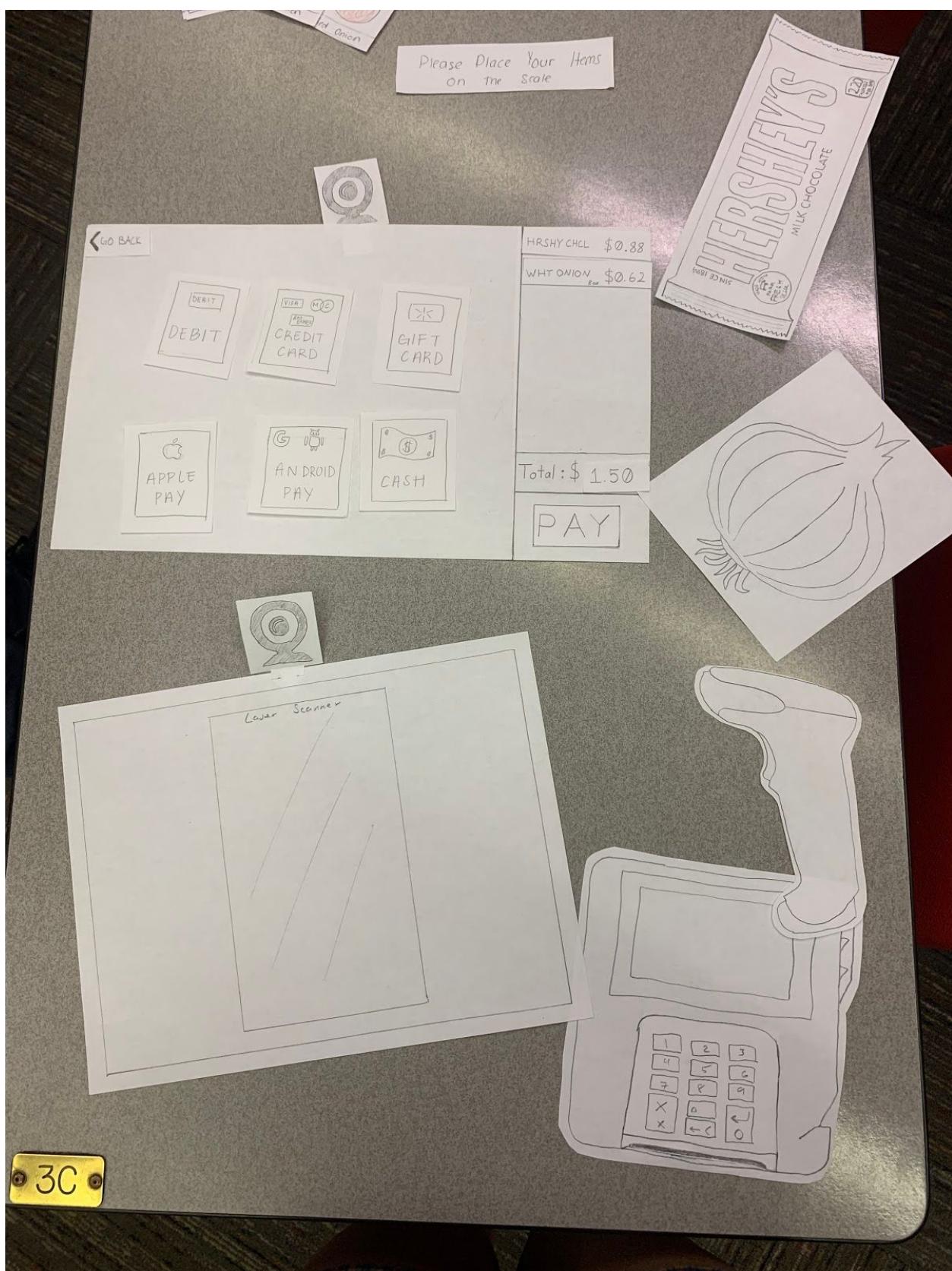
Version 1.1 published December 2, 2019

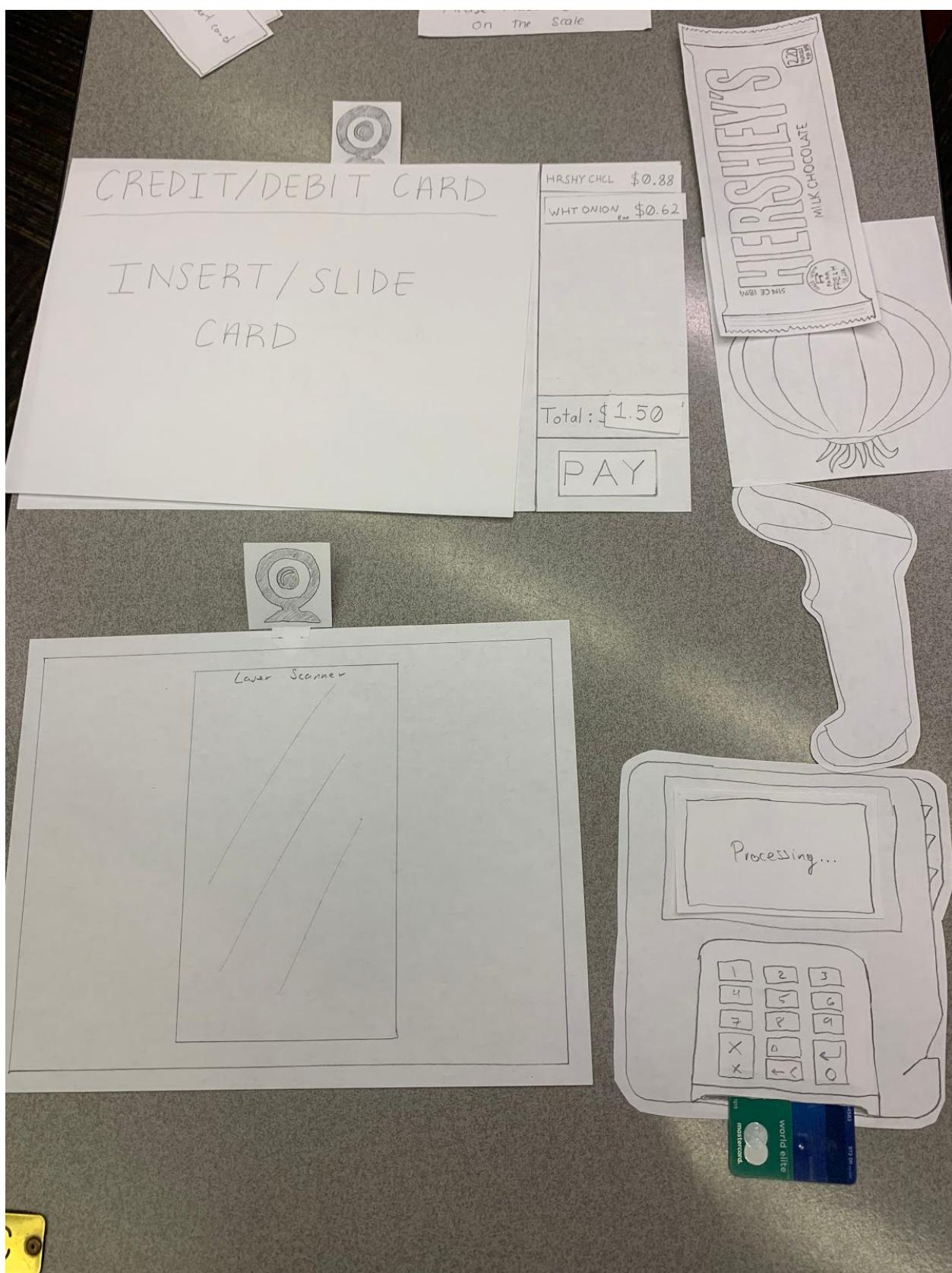
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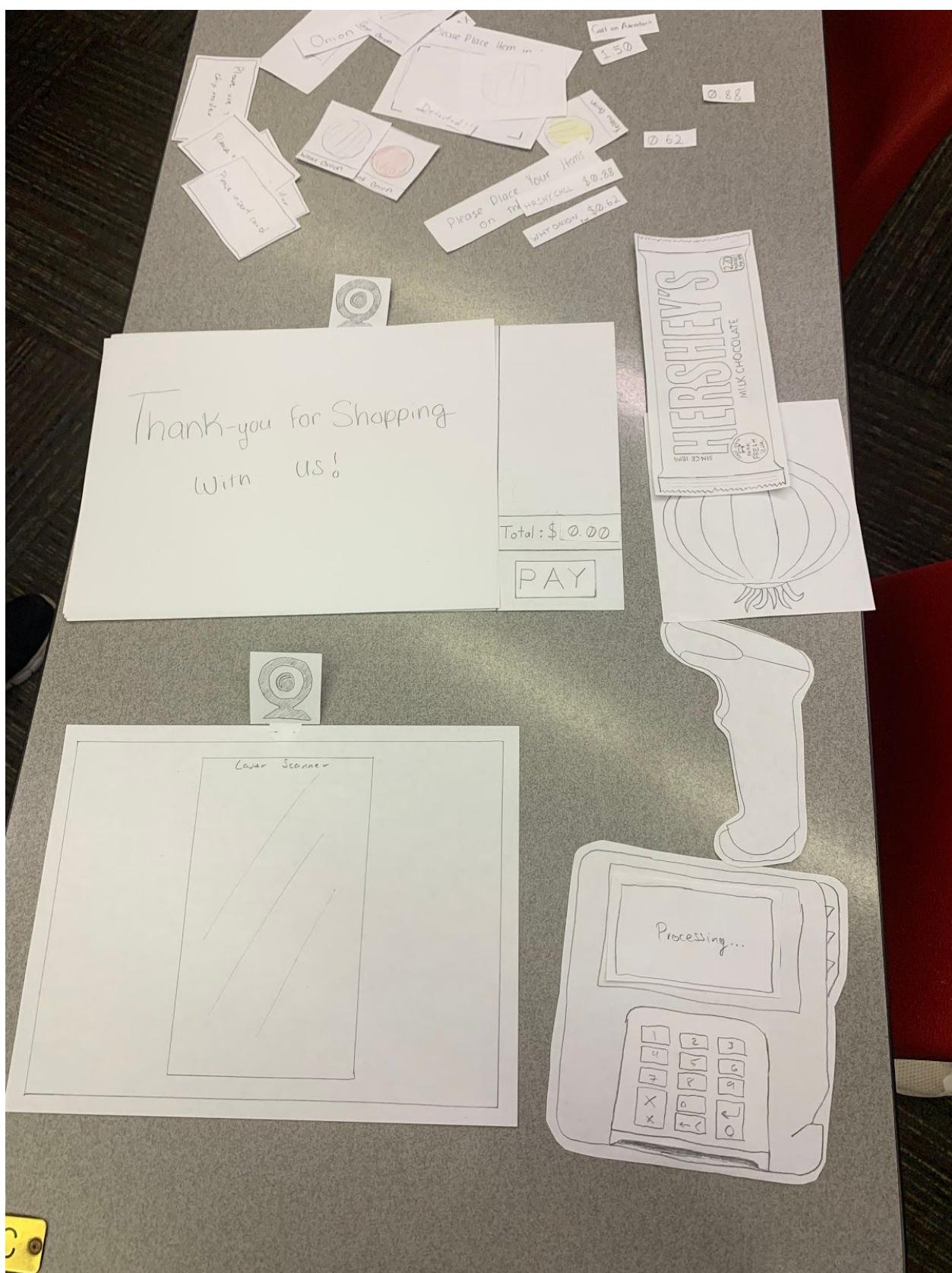
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Paper Prototype Usability Test Plan

Activity Intro Script

Intro Script

"Hi, my name is _____. Thank you for coming to help us out with testing this new interface. We're going to be presenting you with a paper prototype of the interface and would like you to interact with it so that we can gather feedback on what your intuition is when using the interface. There are cameras involved with this test, that will be recording you but none of video data will be kept. Are you comfortable with this setup?"

Ask general questions to gauge the users previous experience:

- Have you ever used self-checkout?
- When is the last time you used self-checkout?
- How often do you use self-checkout?

SCENARIO 1

- **Scenario intro script:** Imagine you're an undergrad student who is very familiar with using technology. You want to go to the store to buy groceries to meal prep for the week. After gathering your items, you head to the self-checkout terminals.
- **Task 1: Purchasing the Hershey's bar**
 - **Prompting questions:**
 - If the user chooses to detect item, ask "what do you think will happen next?"
 - If the user chooses to scan item, ask "what made you choose to scan the item?"
 - **Focused questions:**
 - If user did not choose detect item, ask "did you notice the detect item button?"
 - If user did not choose to scan item, ask "what made you choose to detect item?"
 - **Task is completed when:**
 - Hershey's bar is added to the list and total is displayed.
- **Task 2: Purchase the onion**
 - **Prompting questions:**
 - If the user chooses to detect item, ask "what do you think will happen next?"
 - If the user chooses to search item, ask "what made you want to search for the item?"
 - **Focused questions:**



- If the user doesn't notice the detect item button, ask "did you notice the detect item button?"
 - If the user doesn't notice the search item bar, ask "did you notice the search for item bar?"
- o **Task is completed when:**
- Item is added to purchase list and total is shown.

SCENARIO 2

- **Scenario intro script:** Imagine you are an individual, not too familiar with technology. You usually use the cashier to purchase items at a grocery store. Unfortunately, the cashier lines are long, and you only have two items. You decide to use the self-checkout terminal to purchase an onion and a hershey's bar. Unfortunately, you are often forgetful when checking out. So you initially forget to scan your hershey's bar.
- **Task 1:** You want to purchase the onion fast
 - o **Prompting questions:**
 - If the user uses the camera to search for the onion item or the search bar, ask "what prompted you to search in this manner?"
 - If the user uses the camera, ask "what do you think happens next"
 - o **Focused questions:**
 - If the user did not use the camera, ask "did you notice the search by picture option?"
 - If the user used the search bar, ask "why did you use the search bar over the camera?"
 - If they used camera or search, "how does this compare to a cashier experience?"
 - o **Task is completed when:** The task is completed when the user is able to successfully add the onion to their total.
- **Task 2:** Try scanning something not from the store
 - o **Prompting Questions:**
 - what do you expect to happen?
 - If they got an error message, "how would you go back to purchasing other items?"
 - o **Focused Questions:**
 - Depending on the method they used (scan, search, camera), ask "why they used [method] for their item?"
 - o **Task is completed when:**
 - The user is able to go back to the original home screen without their item showing up.
- **Task 3:** Pay for your item(s).
 - o **Prompting questions:**
 - if the user check's out without the hershey's accounted for, ask "what are your thoughts on the systems feedback"
 - what steps would you take to resolve the issue? call an attendant or go back?
 - o **Focused questions:**



- If the user attempts to go back, ask “what do you think happens when you do go back and scan the hershey’s”
 - how does this loss prevention method make you feel?
- o **Task is completed when:** The user is able to go back, scan the hershey’s bar, then successfully checkout.

Debrief Script

“This is a self-checkout terminal that has been improved to aid with loss prevention, both intentional and unintentional. It uses the cameras to not only to monitor your activity, but to implement a new A.I. technology that will make your shopping experience easier and safer. You will have all the normal capabilities that you may be used to when using a self-checkout terminal, including the built-in weight scanner and handheld scanner”

Results from Paper Prototype

Person 1 - A normal purchase at the store

When testing the prototype, person one used the scanner for the chocolate bar. Afterwards, person one didn’t know the name of the onion, so they clicked “detect item”. Then to check out, they decided to go with cash.

Person one liked the detection part as they found it easier to detect than to manually search for the item. They found that there were too many pages to go through such as scan item, new page for the item, selecting the item, and weighing the item. They would find it more efficient if all of these would make it to one page. Despite these, person one liked the options for payments such as gift cards, credit cards, and mobile payments.

Person 2 - Forgetting to scan an item in the cart

When testing the prototype, person two clicked on detect item for the onion. Immediately afterwards, they clicked “pay now”. After seeing the warning message, person two went back and scanned the chocolate bar.

Person two liked the warning message as it wasn’t all up in their face, and it wasn’t too small to not be noticed. They also liked how the cameras would be able to detect if an item were still in the cart.

Person 3 - Confusing attendant feature

Person three liked our design overall. They thought the system was simple. At first they were confused about item detection but they ultimately got the hang of it. When they tried stealing an item they called the attendant and asked how the screen state changes.



Design Changes (PP)

Our user research indicated several flaws in our design approach. First and foremost, on the homepage there wasn't a search bar. Therefore, if the user wanted to search for the good they had to first scan or be forced to use item detection. Therefore, we needed to add the search bar to the home page.

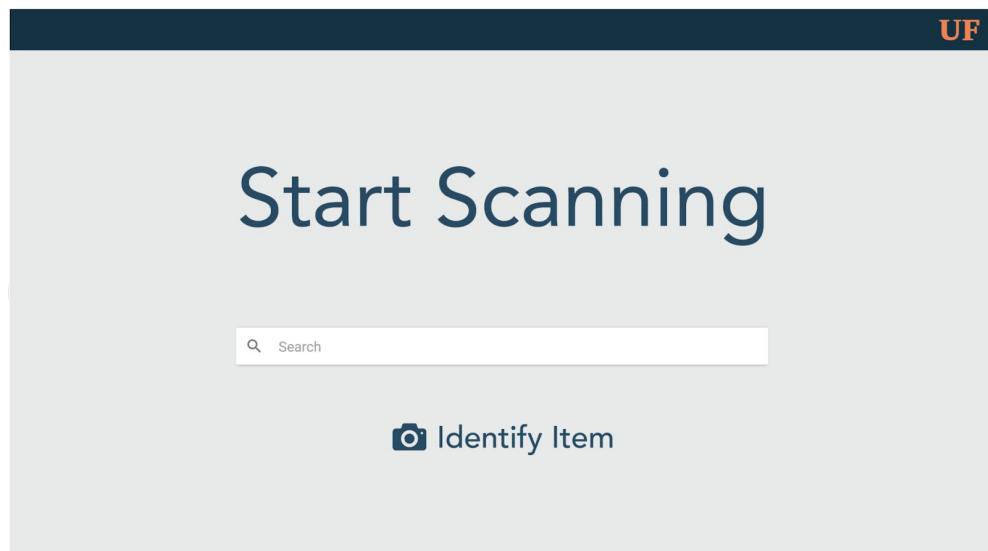
At first, we also had item detection be correct every single time. A user pointed out that, that wouldn't always be the case. Therefore, We realized 'item detection' wouldn't necessarily result in the correct item every time. Therefore, we gave the users more control in deciding what item they are ringing up. After 'item detection' the user is directed to a screen to verify their item.

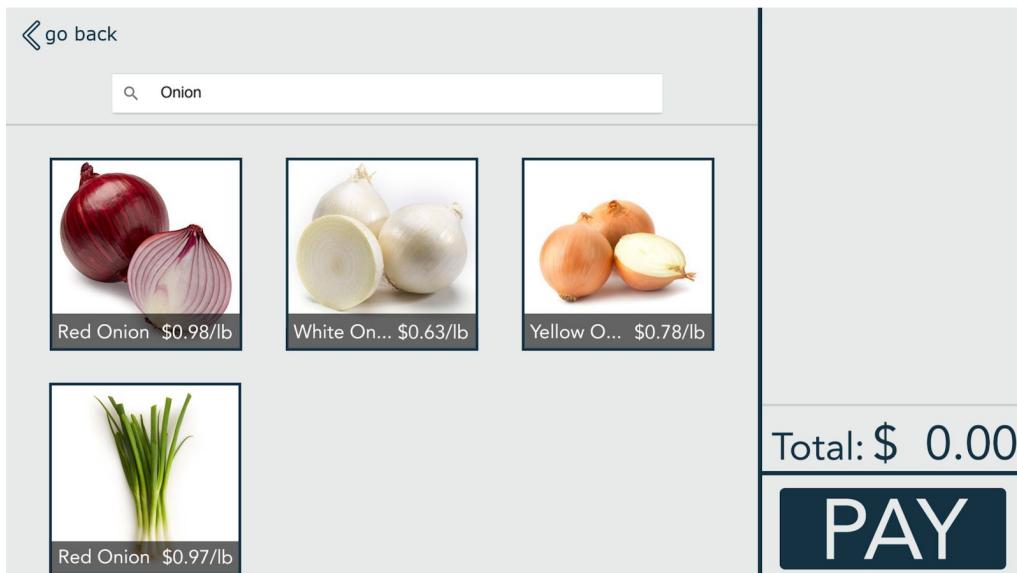
The final thing we had to change, was adding a waiting screen when an attendant was called. Users brought to our attention that there was no way to indicate what state the system was in following clicking the attendant button

Interactive Prototype

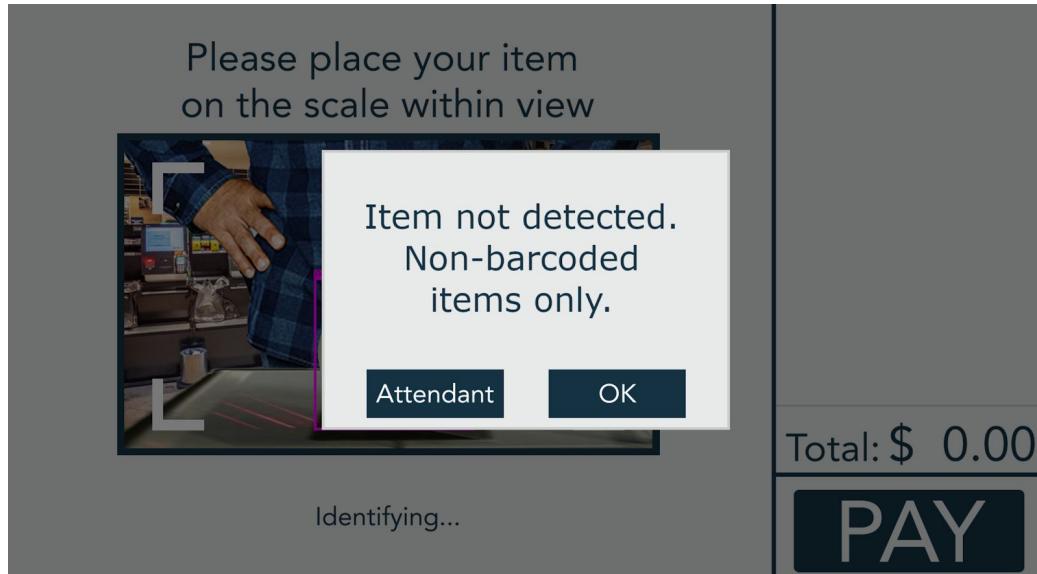
Link to public invision: <https://invis.io/MEUSA239HGC>

Start Screen

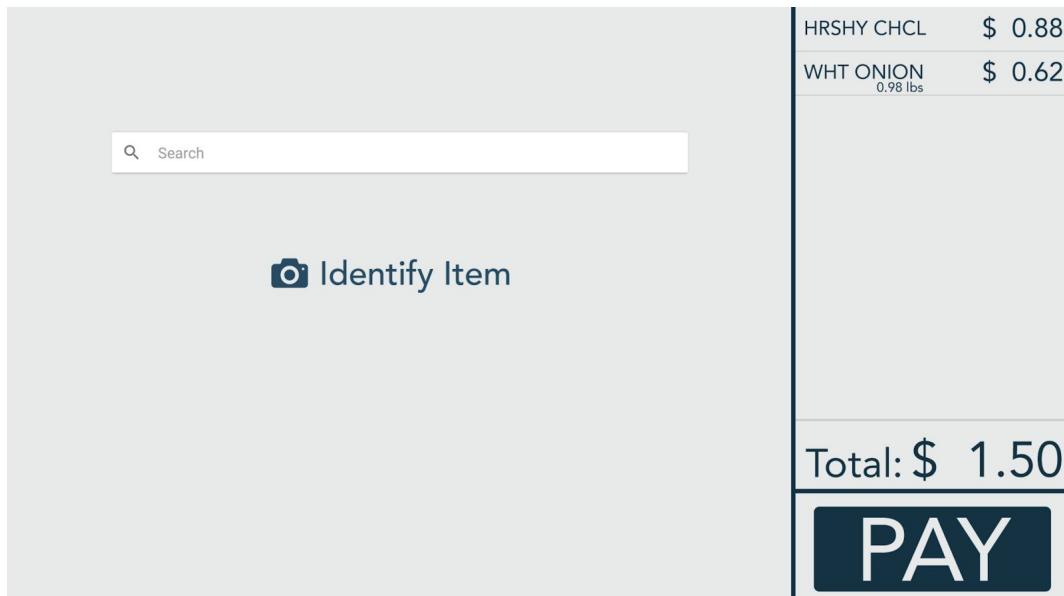


Search Result Screen**Item Identification Screen**

Non-barcode Warning Screen



Main Screen



[go back](#)

Select Payment Method



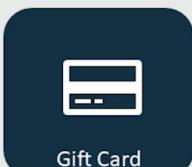
Cash



Credit/Debit Card



Android/Apple Pay



Gift Card

WHT ONION 0.98 lbs	\$ 0.62
HRSHY CHCL	\$ 0.88

Total: \$ 1.50

PAY

WHT ONION 0.98 lbs	\$ 0.62
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Search

Warning!
Please check your
basket for unscanned
items

Attendant

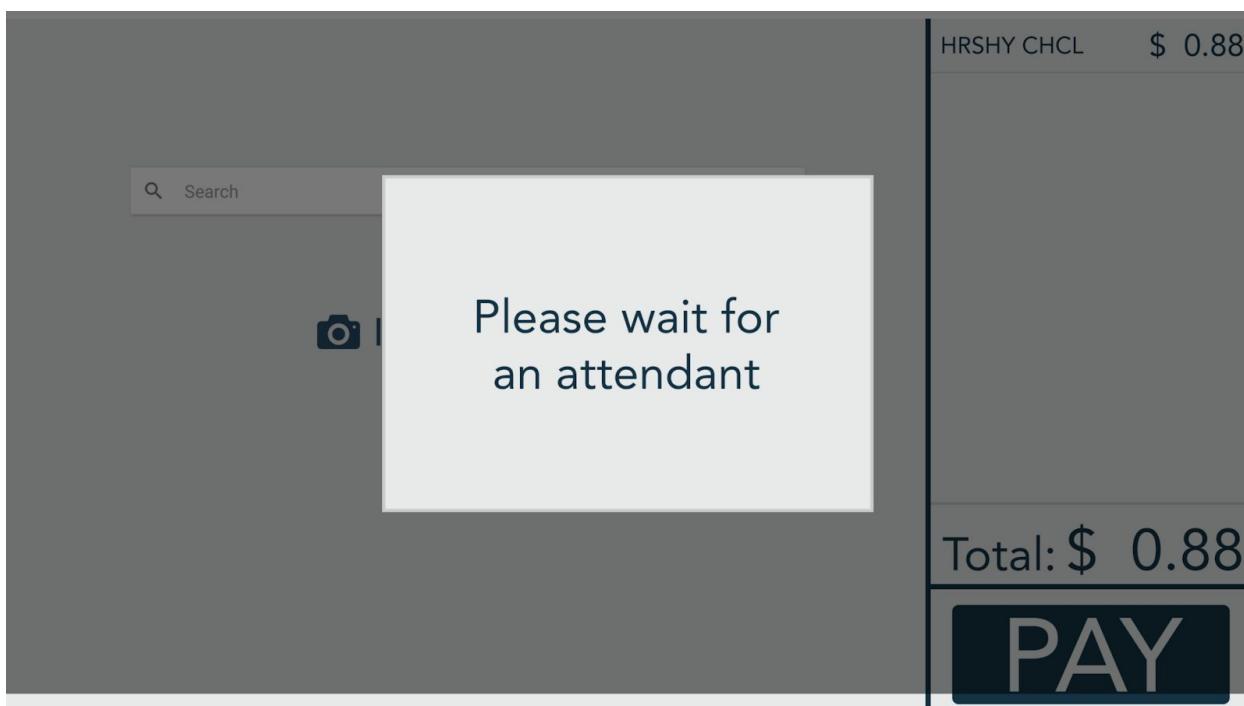
OK

Total: \$ 0.62

PAY



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Usability Test Plan

To ensure we are testing the features we implemented we will be giving the user direct tasks.

Before the start of testing, we would like to ask the user some general questions to get a better understanding of their skill set. As well as their experience with self-checkout, specifically understanding the frequency in which they use it and their last time using.

Basic Questions to Familiarize Ourselves with the type of User:

1. How would you describe your technical skills?
2. When was the last time you used self-checkout?
3. How often do you use self-checkout?

Activity Intro Script

Intro Script

"Hi, my name is _____. Thank you for coming to help us out with testing this new interface. We're going to be presenting you with a paper prototype of the interface and would like you to interact with it so that we can gather feedback on what your intuition is when using the interface. There are cameras involved with this test, that will be recording you but none of video data will be kept. Are you comfortable with this setup?"



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- **Task 1 - “Stealing the Items”:** Try checking out without ringing up your item(s).
 - **Prompting questions:**
 - Out loud tell us how you would go about stealing an item, or *intentionally* forgetting to ring up an item.
 - What are you expecting the machine to do?
 - **Focused questions:**
 - After seeing the warning, if the user chooses to seek the help of an attendant, ask why?
 - After clicking the pay button, if the user chooses “ok,” ask why they made that decision?
 - **Task is completed when:**
 - The user goes back to the main screen to ring up their items.
- **Task 2 - “Item Detection”:** Purchase the onion
 - **Prompting questions:**
 - If the user chooses to detect item, ask “what do you think will happen next?”
 - If the user chooses to search item, ask “what made you want to search for the item?”
 - **Focused questions:**
 - If the user doesn’t notice the detect item button, ask “did you notice the detect item button?”
 - If the user doesn’t notice the search item bar, ask “did you notice the search for item bar?”
 - **Task is completed when:**
 - Item is added to purchase list and total is shown.
- **Task 3:** Purchase the onion quickly
 - **Prompting questions:**
 - If the user uses the camera to search for the onion item or the search bar, ask “what prompted you to search in this manner?”
 - If the user uses the camera, ask “what do you think happens next”
 - **Focused questions:**
 - If the user did not use the camera, ask “did you notice the search by picture option?”
 - If the user used the search bar, ask “why did you use the search bar over the camera?”
 - If they used camera or search, “how does this compare to a cashier experience?”
 - **Task is completed when:** The task is completed when the user is able to successfully add the onion to their total.
- **Task 4:** Try scanning something not from the store
 - **Prompting Questions:**
 - what do you expect to happen?
 - If they got an error message, “how would you go back to purchasing other items?”
 - **Focused Questions:**
 - Depending on the method they used (scan, search, camera), ask “why they used [method] for their item?”



-
- o **Task is completed when:**
 - The user is able to go back to the original home screen without their item showing up.
 - **Task 5:** Pay for your item(s).
 - o **Prompting questions:**
 - if the user check's out without the hershey's accounted for, ask "what are your thoughts on the systems feedback"
 - what steps would you take to resolve the issue? call an attendant or go back?
 - o **Focused questions:**
 - If the user attempts to go back, ask "what do you think happens when you do go back and scan the hershey's"
 - how does this loss prevention method make you feel?
 - o **Task is completed when:** The user is able to go back, scan the hershey's bar, then successfully checkout.

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"This is a self-checkout terminal that has been improved to aid with loss prevention, both intentional and unintentional. It uses the cameras to not only to monitor your activity, but to implement a new A.I. technology that will make your shopping experience easier and safer. You will have all the normal capabilities that you may be used to when using a self-checkout terminal, including the built-in weight scanner and handheld scanner"



Results from Interactive Prototype

Usability Test Tracking

Tasks

Task ID	Task Description
1	Steal an item (Don't ring it up)
2	Manually enter the onion
3	purchase the onion quickly
4	Scan something not for sale at the store
5	Pay for your item(s)

Participants

Participant ID	Name
1	Geraldina Zhang
2	Pablo
3	Justin
4	Mckenna
5	Josh

Success Rates

Participant ID	Task ID	Success	Failure	Behaviors
1	1	1	0	Clicked on attendant help
	2	1		Type in Onion, went through transaction
1	3	1		Used item detection
1	4	1		System did not react
	5	1		completed transaction using credit card
2	1	1		went back and scanned the item
2	2	1		search required more time than item detect
2	3	1		Used item detect
	4	1		Unable to scan non-store good
2	5	1	0	Checked out successfully
3	1	1	0	Unable to steal



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3	2	1	0	Users item detect
3	3	0	1	Used manual typed input
				Unable to scan non-store item
3	4	1	0	Able to checkout
				Rolled item out of camera view before walking up. Attendant validated purchase
4	1	0	1	success
4	2	1	0	Used item detect
				Didn't understand the response
4	4	0	1	Able to pay
4	5	1	0	Unable to steal
5	1	1	0	Used search feature
5	2	1	0	Used item detect
				Tried to item detect non-store item
5	3	1	0	Able to pay
5	4	1	0	
5	5	1	0	

Errors

Participant ID	Task ID	Error	Error Category	Severity
e.g., 1	e.g., 1	e.g., Tapped on logo	e.g., Accessing homepage	e.g., High
5	2	Tried scanning a non-barcoded item	Manual input	medium
3	none	Could not remove an item after scanning twice	Deletion	high
4	1	Able to steal an item	Intentional Loss	Low

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Participant Notes

Participant 1:

Used system as intended. Performed all tasks.

Tried stealing the hershey's bar, but since they came up with it the system accounted it. When checking out the system warned them they would not be able to proceed to checkout.

The user was confused about how the system knew (maybe we could explain?)

The user went back - scanned the hershey's bar.

Participant 2:

Though the system was easy to use. Didn't really have any apparent issues with the system.

Item detect sparked curiosity. Prone to use it over type search feature. Experienced the extra step relating to the item detect. Wondered why there was that extra step.

Participant 3:

Scanned the hershey's bar twice, wondered how to delete. The slide deletion wasn't intuitive to the user. Other than that, thought the system was easy to use. Just curious as to how certain aspects worked, like exactly how items were being detected. (*we are undecided if this should be accessible to the user -- as it may give them the information they could use to intentionally steal goods*)

Participant 4:

Before walking up to the machine, the user intended to steal their onion. They did this by rolling the onion past the self-checkout machine. The self-checkout machine therefore did not account the onion in the participants purchasing list. The user was able to proceed to checkout with just the hershey's bar. This is an intentional loss that our system does not account for, but maybe we could incorporate a way to prevent this.

Participant 5:

For the most part, successfully completed all tasks. They brought to our attention the problematic item detection. The user thinks they can detect any item -- even those with a barcode. They didn't understand why their item would not detect.

Design Changes (IP)

Users need to be informed of the scenarios they would use the "detect item" feature. Some would try to use the feature as a way to detect items with barcodes, even though the feature was intended to be used on non-barcoded items (produce). Users also indicated there was trouble with deleting an item. The process was not intuitive because swipe delete is typically only found in mobile devices, rather than a large computer sized device.

Therefore, in our final dynamic prototype we added changes to cover these aspects discovered in our user tests. First, we added a warning screen (as seen in our mockup) if the user could not detect an item. Then we added a delete button next to each item, so users are more aware of how to delete items.

