

CS 6750 Assignment M3

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Abstract—Nowadays many jobs are being replaced by machines. The self-checkout machine is one of them. It is commonly seen in many places such as wholesale stores and gas stations. It provides convenience but also raises issues that require human intervention. You may have noticed that there is always at least a cashier standing by the self-checkout machines and being ready to assist the customers that have issues with the machines. I have experience of being stuck in the process of the self-checkout and end up having a semi-automated checkout with the help of the cashier. If you have the same experience, join me to find out the reason using the HCI principle and methods, and hopefully redesign the current interface to maximize the capability to fulfill the user's needs. In this paper, we will be focusing on the design and prototype of one task or one part of the interface. The task is identified from the results of the previous need-findings.

1 BRAINSTORMING PLAN

The results from the previous need-findings help me to develop a good understanding of the needs of the users. The next step is to brainstorm how to accomplish the tasks. The task we will be focusing here is the scanning process during the self-checkout. The results indicate that users do not like the current way to scan purchased items and sometimes have an issue with the process. I want to come up with ideas to design a way where the user can easily scan and cancel the purchased items without having to place them near the scanning interface. The plan is as follows:

- Write down the core problem and keep it available
- Force myself to think of solutions that include different human perceptions (visual, auditory, and haptic)
- Plan to have 30 mins to 1 hour for the brainstorming

- My goal is to write down as many ideas as possible within the time frame and write a few sentence descriptions and some drawings if needed for each idea.

The rule to be followed:

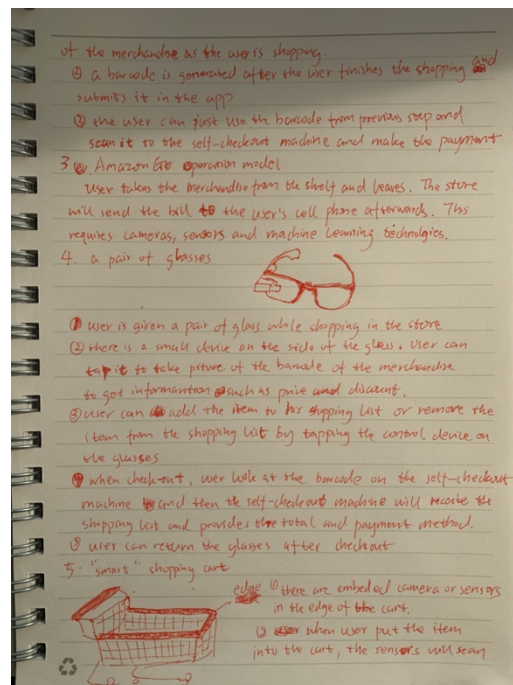
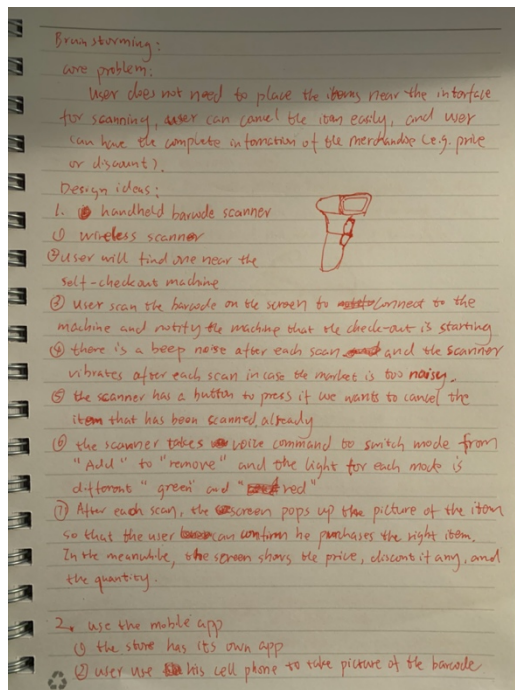
- Focus on the core problem where the user does not need to place the items near the machine interface for scanning, the user can cancel the item easily, and the user can have the complete information of the merchandise (e.g. price or discount) while scanning.

The standard to be followed:

- The user should not do more than what they are currently doing with the new design.
- Focus on the core problem.
- Write as many ideas as possible without evaluation.

2 BRAINSTORMING EXECUTION

My brainstorming approach is to write down a list of high-level design ideas on a worksheet. Below is a picture of the brainstorming sheet.



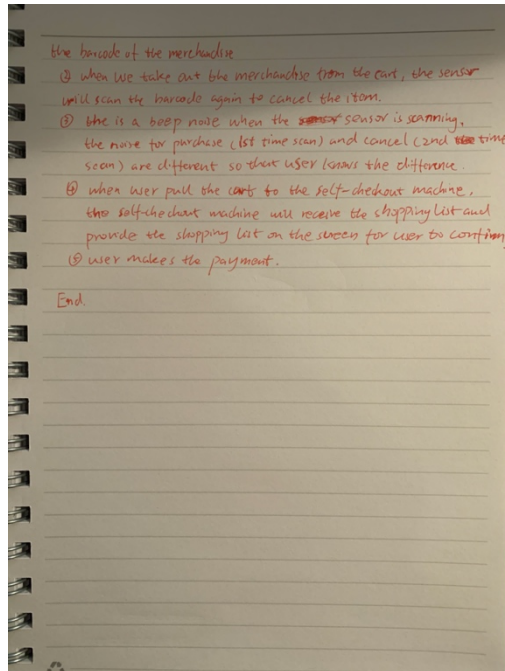


Figure 1

3 SELECTION CRITERIA

The following criteria were used to select ideas:

- In M2, the data inventory or the requirements related to the scanning process are:
 - Users shop at Costco where the items are normally big, so they complain about the scanning big size items.
 - The user needs an easy and efficient checkout process.
 - The objects were the merchandise the user selected and added to the cart.
 - The users wanted to know how much they need to pay for the items in their cart and the discounts.
 - Users in the survey mentioned the scanning would be easier if he or she was provided with a scanning gun (i.e. handheld barcode scanner).
 - In terms of scanning items, guidance should be clear and easy so that the user does not bear too much cognitive load.
- The cost of the redesign should be affordable.
- The interface should be consistent with what the users are already comfortable with.

- The interface should have a small gulf of execution for both expert and novice users.

I would choose the handheld barcode scanner, mobile app, and a "smart" shopping cart based on the above criteria. Many users are comfortable with the handheld barcode scanner which is an existing design. It is easier for users to learn the new features we would add to the scanner. The mobile app is also a consistent design that most users are comfortable with. Users would use it on their own cell phone so there should be a small gulf of execution. The "smart" shopping cart does not require any additional effort from users to scan because the cart would automatically scan the merchandise as the user put it into the cart. All these three ideas are focusing on an easy and efficient checkout process and have a small gulf of execution. More importantly, these ideas are more affordable than the Amazon Go and Google glass equivalent ideas which may require expensive intellectual properties.

4 PAPER PROTOTYPE

The below figure shows the paper prototype of an interface of the mobile app that users can use to scan merchandise and add to the shopping list.

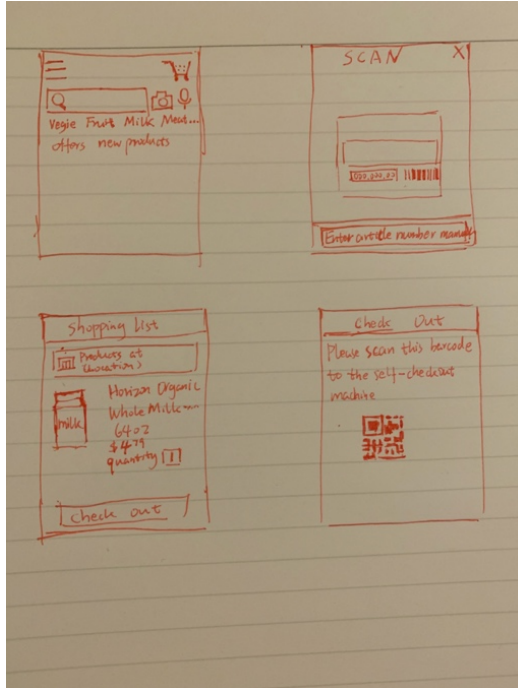


Figure 2

Requirements covered in this prototype:

- Users can use the camera function to scan the barcode of the merchandise as the user is shopping groceries. The user does not need to take each item out of the cart when doing the check-out. Instead, the user can simply scan the 2d barcode to the self-checkout machine to make the payment.
- Users can see the details of the product including the price, discount, and quantity, etc. on the shopping list.
- Users can have an easy and efficient checkout process with this app.
- The interface is designed similarly to the online shopping interface of Amazon and Ikea which users are used to and comfortable with. Therefore, users have a less cognitive load.

All the requirements are well covered in this prototype so there are no missing requirements.

5 TEXTUAL PROTOTYPE

Below is the textual prototype of the handheld barcode scanner design.

- When the user does the self-checkout, he/she is provided with a handheld barcode scanner. This scanner is wireless so that the user can scan all the purchased items without taking them out of the shopping cart.
- The user first uses the scanner to scan the barcode on the self-checkout screen to start the scanning process.
- The scanner has a button to switch from “adding to the shopping list” to “removing from the shopping list” or vice versa.
- The light of the scanner turns green when adding to the shopping list but red when removing a certain item from the list.
- The scanner also vibrates when scanning items in case the grocery store is noisy.
- The scanner takes voice command to switch mode.
- For each scan, the self-checkout screen pops up the picture of the merchandise so that users can confirm they purchase the right items. The user can confirm the final price and discount from the screen as well.
- A human voice guides the user from the start to the end and also reads out the price and quantity after each scan.

Requirements covered in this prototype:

- The user does not need to take each item out of the cart when doing the check-out. Instead, the user can use the wireless handheld barcode scanner to scan all the items in the shopping cart.
- Users can see and hear (via human voice) the details of the product including the price, discount, and quantity after each scan.
- Users can have an easy and efficient checkout process with the handheld barcode scanner.
- The interface is designed similarly to the online shopping interface of Amazon and Ikea which users are used to and comfortable with. Therefore, users have a less cognitive load.

All the requirements are well covered in this prototype so there are no missing requirements.

6 VERBAL PROTOTYPE

Below is the verbal prototype of the “smart” cart. It takes the form of a loose conversation script between me and my friend:

Me: Hi. Did you do any grocery recently?

Friend: yes, I did groceries this Friday.

Me: where?

Friend: Costco.

Me: did you get a lot of stuff?

Friend: yes

Me: did you do the self-checkout?

Friend: of course not! I don't want to lift the 40-pack of water from the cart to the checkout desk.

Me: true. I have come up with this new feature for the shopping cart so that you don't need to take out anything even the small items from the cart when doing the checkout.

Friend: sounds interesting. What is it?

Me: Let's assume we implement many small sensors along the edge of the shopping cart. So when you put an item into the cart, the sensors would capture the barcode and make the beep noise. If you don't want an item in the cart anymore, as you take out the item from the cart, the sensor will sense the barcode again and make a different noise to let you know this item is being removed from your shopping list. When you push the shopping cart close to the self-checkout machine, you would hear a beep noise from the self-checkout machine. It means your shopping list captured by the cart has been transferred to the self-checkout machine. You will then see a running list of the purchased items on the screen which includes price, quantity, and discount if any.

Friend: that sounds interesting. What if the barcode is at the bottom when I place it in the shopping cart? Will the sensors at the edge be able to capture that?

Me: you have a good point. It seems like we should place some sensors at the bottom of the shopping cart as well.

Friend: I would use your shopping cart if it is available!

Requirements covered in this prototype:

- The user does not need to take each item out of the cart when doing the check-out. Instead, the user can simply push the cart close to the self-checkout machine and in that way, the shopping cart can send the shopping list to the self-checkout machine.
- Users can have an easy and efficient checkout process without spending any extra time and effort. Therefore, users can have a less cognitive load to learn a new interface.

Requirements missed:

- Users can see the details of the product including the price, discount, and quantity, etc. as they are doing the groceries. In this prototype, users cannot see the product details until the final check-out step.