CS 6750 Assignment M2

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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 discuss the results from the three need-finding plans outlined in Assignment M1.

1 PARTICIPATION OBSERVATION

1.1 Summary of Results

I went to Costco and purchased 10 items including the big size items such as a pack of 40 bottles Kirkland water. There was no start button showing on the screen. Instead, the screen showed a picture where a membership card was facing up and was hovering over the scanning machine. Also, the screen provides another picture where the three types of membership cards were presented along with some words "Please Scan Your Membership Card or Touch Need Assistance". I then took out my membership card and let the front of the card face up and scanned it over the scanning window. The scanning window has the red light on while I was scanning. With the beep sound, the screen changed. The picture on the top right corner indicates “Scan Item and Place in Tray Area”. Then I started to take each item out of the cart one by one, find the bar code, and let the bar code side face the scanning window. I heard the beep sound after the item is successfully scanned. For the water pack, I asked the staff for help and the staff was available to offer help. He scanned the water pack for me using his

handheld barcode scanner. Before he scanned the item in my cart, he scanned the screen first to connect his device to the machine. I tapped the “Done Scanning Items” button after I scanned the last item. However, the screen did not go to the next step. Instead, a window popped up showing "Please wait, help is on the way". The staff came and fixed it in less than one minute. Then the screen showed the subtotal, tax, and total of my transaction, and also provides me with options to pay or return to scan more items. I pressed the "Pay" button and a picture of the POS machine showed up indicating "Follow instructions on the PIN pad“. I inserted my credit card to the PIN pad until it told me to remove the card. The transaction was done. The screen showed “Thank you. Please take your receipt” and the receipt was printed out from the printing machine located on the left side of the screen.

1.2 Takeaways

I was able to finish my purchase with some help from the staff. I felt I spent more effort into scanning items than checking out with the human cashier. For example, I need to take out each item from the cart including the heavy ones, and look for the barcode. Also, I could scan the water pack by myself if the handheld barcode scanner was provided next to the screen. The instructional picture that shows how to scan an item is not easy to understand. The reason why the assistance was called after I pressed “Done Scanning Items” is confusing and unknown.

1.3 Potential Biases

The first one is I am not my user. I can collect useful insights, but I should be careful of not over-representing my own experience. To avoid this, I invited my friend and let her know about this experiment. I asked her to observe when I was doing the self-checkout and provide feedback afterward. She mentioned the scanning process was time-consuming and the machine error was unexpected. Also, I can validate my takeaways from people's responses to my survey questions. For example, I asked people to rate satisfaction with the process of scanning items.

2 EVALUATION OF EXISTING INTERFACE

2.1 Summary of Results

There are existing interfaces in many other grocery stores. With the prior experience at Costco, I listed a few relevant questions to myself before I went to Safeway to evaluate their self-checkout interface. The interface at Safeway was showing “This Lane is Open” and “Begin scanning or touch here to start” as I walked to the self-checkout station. The screen proceeded to the starting interface when I stood in front of the screen. Comparing to Costco, the interface at Safeway start with more options including "Lookup By Name”, “Quick Lookup”, Spanish language, "Use My Own Bag", "Enter Item Number" and "Enter Phone Number". Safeway has a membership club, which is optional, whereas Costco membership is mandatory. The starting interface did not provide any information related to membership. However, shoppers are told to use the phone number to retrieve their membership when they register for the membership for the first time. Therefore, I know the "Enter Phone Number" option is to apply my membership to this transaction. The instructional picture was showing “Scan Item and Place in Bag”, whereas Costco was showing “Scan Item and Place in Tray Area”. As I did not choose "Use My Own Bag" at the beginning, the "Skip Bagging" option was showing on the screen as I was scanning items. I need to press it so that it can disappear. There was no handheld barcode scanner either so I would need help from the staff if I purchased large size items. There was a "Cancel Item" option in case users accidentally scanned one item multiple times or changed their minds. After I press "Finish and Pay", a window popped up asking "How many store bags did you use today" and there were 4 options to choose – 0, 1, 2, and other. At the payment step, the screen provides options for paying with card or with cash. I chose to pay with a card. While the left part of the screen was showing the breakdown of the payment amount, the right part was showing a picture of how to use the pin pads with users' credit cards. Throughout the self-checkout, a female voice from the self-checkout machine was guiding me on the steps to follow.

2.2 Takeaways

Scanning big size items also require the help from staff if the shopper is not able to lift the item from the cart. The human voice from the screen provides instructions during the checkout process. Paying with cash option accommodates the

customers who prefer to pay cash or who only have cash. Overall the interface at Safeway provides the user with better instructions and more options than the machines at Costco.

2.3 Potential Biases

There are some similar potential biases to the participant observation exercise if I would be the person who conducts the evaluation. Again, the most important one is I am not my user. To limit the impact, I invited a different friend to observe and provide feedback on my self-checkout process. He mentioned the process was smooth and it was his first time to notice that the machine accepts cash. Also, I will test my beliefs by comparing to people's response to my survey questions.

3 SURVEYS

3.1 Summary of Results

Thanks to the participation of my classmates, my survey received 56 responses. As shown in table 1, about 60% of the participants are from ages 18 to 29, and around 30% are from ages 30 to 39. We have 5 participants who are over 40 years old. For participants under age 29, over 70% of them use self-checkout. And the percentage is down to 47% for the participant from ages 30 to 39. However, the percentage is up to 80% for participants over age 40. The three persons who chose other provide their reasons. One person prefers to use auto-checkout such as Amazon Go, one person said the choice depends on the number of items and the other person said it depends on the situation and provides an example "If I am buying produce, cigarettes, or anything that requires a lookup code or cashier authorization, I prefer a live person. Otherwise, it's more efficient to have a self-checkout machine." As for the reason to use self-checkout, the majority of the participants chose self-checkout due to the waiting line, easy to use, and the number of purchased items. In terms of the interface, over 80% of people are either ok or satisfied with the response time, about 70% of people are either ok or satisfied with the experience of scanning items, and 78% of participants are neutral or satisfied with the guidance provided by the machine. The survey also indicates that 80% of the participants have experience of getting stuck with the machine and most of them got it resolved with the assistance of the staff as opposed to figuring it out by themselves. Among the 56 participants, 43 of them provides the changes they would like to make to the self-checkout interface. Over

75% of the responses are related to the scanning process such as the slow scanning, scaling fruit, bagging, and applying the coupon. In the end, I received 13 responses related to their feedback to my survey and the majority likes the survey.

Table 1

Age Range	Count
18 - 29	**34**
cashier	7
other	3
self-checkout machine	24
30 - 39	**17**
cashier	9
self-checkout machine	8
40 - 49	**5**
cashier	1
self-checkout machine	4
Total	**56**

3.2 Takeaways

Most people like self-checkout. They like it because they think it saves time and effort overall as opposed to the human cashier. Most people have been stuck with the self-checkout machine and almost all of them resolved it with assistance from the staff. There are improvements that people want on the self-checkout interface especially the scanning process for various reasons. This also validates my feedback on the scanning experience from the other two need-findings.

3.3 Potential Biases

I may have confirmation bias where I only notice the things that confirm my prior beliefs. To avoid it, I designed open questions in the survey to let participants provide answers. I tried to phrase the questions as impartial as possible so that my prior knowledge or intention does not mislead participants. I tried to set the tasks in contexts so that participants can remember the activities more accurately. Also, I asked my friend to review my survey questions and I, myself carefully reviewed and answered each survey question.

4 DATA INVENTORY

Who are the users? The user for the participant observation and evaluation of the existing interface is me who is from age 30 to 39. For the users who participated in the survey, 34 out of the 56 participants are from ages 18 to 29, and 17 people are from ages 30 to 39. We have 5 participants who are over 40 years old.

Where are the users? The users including me were shopping at the grocery stores where the self-checkout machines were provided.

What is the context of the task? The users selected the groceries and needed to check out to finish the purchase. Some of them shopped at the peak time, while some were not having a waiting line at the cashier. Some of them shopped at Costco where the items are normally big, so they complained about the scanning big size items, whereas some bought only a few small items that are easy to scan. Some users provided the context in their responses to the survey. For example, they mentioned they were purchasing grocery items like fruits and vegetables, and they would have to choose the specific item from the list in the kiosk which is time-consuming.

What are their goals? The users were trying to check out their purchased items and make the payments in a fast and efficient manner. In the survey, most users chose to use self-checkout because they think it is easy to use or they can avoid the waiting line.

What do they need? They need an easy and efficient checkout process to finish their purchase. The objects were the merchandise the user selected and added to the cart. The users wanted to scale some items to know the final price. In the end, the users wanted to know how much they need to pay for all the items in their cart, the discount was accurately applied, and how they can make the payment with cards or cash. The users need a resource to provide easy and fast instructions of what they wanted to do and also a resource to quickly fix the issues if occurred. Each of these needs can be tiered down to specific needs. For example, one of the 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).

What are their tasks? What are their subtasks? Their task is to purchase merchandise. The task can be broken into 3 subtasks on a high level. First, users wanted to let the grocery store know the items they wanted to buy, then find out the total

price of these items as well as the sales tax, and put the items into bags if needed, and make the payments.

5 DEFINING REQUIREMENTS

The interface must provide the basic core functions which are starting the screen, scanning items, and selecting payment. For the starting point, the interface should provide clear guidance of what the user should do. The guidance can be in the form of a short tutorial video. In terms of scanning items, clear guidance is also necessary and the interface must provide a handheld barcode scanner for a user to scan the large size items. For items that do not have a barcode label, the interface can provide a feature of taking a picture of the item and use the algorithm to search for the possible items and output them on the screen. The interface can provide possible reasons for having the error and let the user choose how to deal with it – either to ignore and proceed to the next or to ask for assistance from the staff. This function is designed towards experts versus novice users. The interface must have an option for users to choose whether to use their own bags, and there will be no bagging reminders/messages after users use their own bags. In terms of the payment process, the interface must provide clear guidance on how to make the payment, such as a short tutorial video playing on the screen. To evaluate the prototype, I would recruit six users that represented the average audience of the self-checkout machine, and ideally, three of them are novice users and the other three are fairly tech-savvy. Then, I would provide them with the outline and instructions of the prototype, and then let them act as normal and think out loud. I observe them, take video recording, and then ask them a list of the prepared questions at the end.

6 CONTINUED NEEDFINDING

I should add a question or two to ask the user's level of expertise on the self-checkout interface. I need to add questions to ask the context and location to complement the existing questions. For example, I would like to know if the user was shopping at a peak time because the user would be under pressure to do the checkout and their emotion would impact their interaction with the machine as well as their feedback on their self-checkout experience. Also, I would like to know where the user was shopping when they had an issue with the scanning process. Their issue with the scanning may be due to the size of the purchased

item if they were at Costco. Providing specific context not only helps the participants to retrieve their memory but helps me to collect more accurate data for the analysis. Also, I could ask a follow-up question to the rating satisfaction question to ask why the user provided that rating.