CS 6750 Assignment M1

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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.

1 PROBLEM SPACE

Need finding is to develop my understanding of the needs of the user that would use a self-checkout machine in all contexts. To do the need-finding, the first thing is to identify the problem space, which means the scope of the space we are looking at. It could be as narrow as focusing on the interactions between the customer and the self-checkout machine. The interactions can be regarded as a replication of the actions that the customer and human cashier do during a purchase. The problem space can be also zoomed out to be broader questions. Why does the customer choose the self-checkout machine in the first place? Is it because the self-checkout is the only option like what is happening in the gas station, or there are lines of people waiting at the cashier counter, or the customer is simply curious and wants to experience the technology, or the customer tries to avoid human contacts in certain circumstances such as Covid-19 impact. Why does the customer choose the cashier over the machine? Is it because the customer has an impaired vision, or the customer is a novice in technology and does not trust himself/herself to be able to independently finish the purchase on the machine, or the customer prefers to have human interactions such as greeting and small talks? As we explore the needs, we need to take the broad approach and try to

understand the entire problem rather than solely the user's interaction with a specific interface. The target is to redesign the self-checkout process including the interface to make people feel it is an easy operation and it is fun to play the machine along with the goal to mitigate the risk of having the hacks and errors that drive customers away from the self-checkout.

2 USER TYPES

After we have some ideas about the physical space of the problem, we want to get an idea of the space of the user. In other words, whom are we designing for? We want to collect data about the full range of users. The redesign of the self-checkout is aiming to benefit people who are old enough to make a purchase and do not have an impairing vision. Specifically, from the age perspective, the redesign is expected to serve the old people, especially those who think they don't know what to do on a machine without any human help. From the personal habit perspective, the redesign is aiming to assist people who are used to use cash to make payments. From the level of expertise, the redesign is going to provide a simple process to the people with very little experience of using a machine interface. From the user's experience perspective, the redesign is going to better incorporate customer's needs and refine the process to mitigate the risk of having hacks and errors. Customers are motivated to use the self-checkout because the operation is simple, fun, and error-free.

3 NEEDFINDING PLAN 1 – PARTICIPATION OBSERVATION

3.1 plan

It is not enough to get feedback from people engaging in a task. We want to experience the task for ourselves. Here is my plan. I will first do some research online and find out a list of the grocery stores where the self-checkout is provided. I can think of three stores which are Costco, Target, and Walmart. I will then select two time frames to shop at each store. I want to choose a quiet time when I would be able to spend time playing with the self-checkout machine and videotaping my operations and my comments from the observation. I also want to choose the peak time when I could operate under the pressure by having other customers waiting behind me. Another reason for choosing peak time is that I can have a comparison of using the self-checkout and purchasing with the cashier on the same item. I will record the time of each check-out process.

3.2 Data Inventory Items

The participation observation exercise can explain some of the items on the data inventory list. Going to the grocery stores and checking out merchandise with self-checkout machine address the questions "where are the users?", "What is the context of the task", and "what are the users trying to accomplish?" Also, my main task of using the self-check machine is to finish a purchase transaction which can be further broken down to subtasks including scanning items, bagging, putting the items back to the cart, and making payments.

3.3 Potential Biases

There is some level of potential biases from the participation observation exercise. The first one is I am not my user. I can collect useful insights when I work as a participant observer, however I should be careful of not over represent my own experience. I should use this experience as a participant observer to inform what I can ask users in the surveys. I am also subject to voluntary response bias when doing the participation observation. I would have stronger opinions because I had a bad experience with the self-checkout machine, and I knew my purpose is to redesign the interface. My judgment could be biased. Also, during the process, when I think about the self-checkout process deliberately, and that could change the way I act when doing the self-checkout. To limit the impact of these biases, I will try to make myself not to think too much and play with instincts during the self-checkout. I will also not over represent my own experience and use this experience as a reference for what to ask in the surveys.

4 NEEDFINDING PLAN 2 – EVALUATION OF EXISTING INTERFACE

4.1 plan

There are existing interfaces in many physical locations. As mentioned above, there are grocery stores such as Target, and gas stations such as Mobile. The steps and the methods for evaluation of the prototypes can be applied to the evaluation of the existing interfaces which I am aiming to improve or redesign. I will draft a list of the questions to ask myself for the evaluation, and also later in the survey. From an efficiency perspective, I want to know how long it takes for the user to accomplish the self-checkout. In terms of accuracy, I may ask how many errors the user commits during the task. Ultimately, I want an interface the reduces the

number of errors. The above two questions are based on the assumption that the user is an expert or at least know how to use a self-checkout machine. This raises another question of how long it takes for a novice user to hit the level of expertise. The expertise can be further broken down into specific subtasks in the system. Another indicator of a good interface is the user's ability to remember how to use the interface after a while. In the end, I want to know the user's overall satisfaction with using the interface to finish a purchase. The interface needs improvement if the user does not enjoy the process.

4.2 Data Inventory Items

The evaluation of the existing interface can help to explain some of the items on the data inventory list. Evaluation should include the questions of "who is the user?" and "where are the users?" because people with different ages or gender or level of expertise have different expectations of the interface in a different context. To evaluate the interface, the user needs to be in the context of making a purchase and knows their goal is to finish the purchase with the machine. As for the specific context such as waiting-lines at the cashier, we may not be able to know from the evaluation. The tasks should be known as the user performs tasks via the interface to give the evaluation.

4.3 Potential Biases

There are some similar potential biases to the participation observation exercise if I would be the person who conducts the evaluation. Again, the most important one is I am not my user. I can collect useful insights when I work as a participant observer, however I should be careful of not over represent my own experience. If I ask someone else to do the evaluation, then I may be subject to the confirmation bias where I see what I want to see with prior beliefs. To limit the impact, I should try to look for the signs that I am wrong, test my beliefs empirically, and maybe involve more people in the process. Directly interacting with other users, I may subconsciously bias them while speaking with them about my experience with the self-checkout machines, phrasing questions in a way that elicits the answer that I want to hear. I should try to avoid express my opinions before the evaluation and try to have someone else review my questions.

5 NEEDFINDING PLAN 3 – SURVEYS

5.1 plan

The observation and evaluation require significant time and effort for a relatively small data if only 2-3 users are involved in these two exercises. We definitely need broader data. I want to know how many users encounter the same issue as I come across when engaging the same task (i.e. self-checkout). I also want to know the qualitative feedback from a broader user population and whether they have similar feedback as I have from the evaluation of the existing interfaces in the market. Surveys provide a larger number of responses quickly and the questions can be phrased objectively. With the internet, they can be administered asynchronously for at a low cost. Our class provides a platform (i.e. PeerSurvey) where I can easily collect the data I need in the meanwhile I am also motivated to complete a survey for other students' in exchange for the class points. I will be following the five tips for designing and administering effective surveys. I will ask the following questions with a detailed explanation of each option along with the questions.

What is your age?

What is your gender?

From 1 to 5, rate your satisfaction with the scanning function of the self-checkout interface at which place (user's input). More follow up questions related to other functions (e.g. payments) of the self-checkout machine.

From 1 to 5, rate your level of familiarity with the self-checkout interface.

How many times have you used the self-checkout interface so far? (provide a range of numbers to the user)?

Describe the time you need to find ways to hack around the limitation of the self-checkout interface.

How many times have you come across an error when using the self-checkout interface?

What type of errors – slip or mistakes or others (please describe)?

In the past 10 days, how many times have you used the self-checkout interface?

Do you feel you would use self-checkout more if the machine accepts cash?

5.2 Data Inventory Items

The survey exercise can explain all the items on the data inventory list if the questions are well designed and drafted. We can have open-ended questions to collect the qualitative feedback from each user in terms of the user's biographical information, the context of the task, the user's goal, and tasks.

5.3 Potential Biases

I may have confirmation bias where I only notice the things that confirm my prior beliefs. To avoid it, I should try to look for signs that I am wrong, to test my beliefs empirically, and involve more individuals. I may be subject to observer bias when I am interacting directly with users. I might accidentally phrase questions in a way that elicits the answers that we want to hear. I should have someone else review my survey questions and I, myself should carefully review and answer each survey question. There may be a voluntary response bias as well. If I perform quantitative analysis on surveys from people with strong opinions, there may be a risk of over sampling of extreme views. Therefore, we should limit how much of the survey content is shown to users before they begin the survey and we can confirm the conclusions with other methods than the survey. Also, sometimes people are not good at recalling what they did, what they thought, or how they felt about tasks they engaged in the past. This may lead to misleading and incorrect data. We should try to set the tasks in contexts so that users can remember the activities more accurately.