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Project 3- User Observation Study Report

I. Introduction

An ongoing concern with equipment logging systems at University of Oregon Housing is how to maintain a reliable log of which equipment is currently checked out, to whom it was checked out, and for how long the individual has had the item. Serving hundreds of students daily regarding matters related to university housing, service desk employees must maintain accurate equipment logs so as students do not get incorrectly charged late fees and so equipment does not go missing.

This study compares the current system used by the service desk with a new graphical user interface (GUI). Currently, the service desk employees maintain a Microsoft Excel spreadsheet which tracks student and equipment information (Figure 1). As equipment is checked out, the student enters in the resident's information, the date and time, and the equipment information. When the equipment is returned, the student must fill out the last 2 columns of the row and transfer the whole row to another spreadsheet. The new system (Figure 2) maintains a database of the desk equipment. To check an item out, a student presses the button "Check Out" from the main menu which opens a dialog box. Then they enter the student's information and select the item from a series of drop down menus. To check an item in, the student must press the "Check In" button from the main menu which opens a dialog box. Then they enter the item information to check the item back in.

The goal for this study is to determine which system will be most effective in helping student employees complete their task as quickly as possible while maintaining a high level of accuracy. Accuracy is measured by how effectively they can translate student and equipment information without error. An error might include incorrectly typing the student's identification number or name. This mistake can be costly as it may be necessary to communicate with the student later about the transaction if the item were to be returned late, damaged, or is not returned at all. Speed is measured by how long it takes in seconds for the transaction from start to finish. It is hypothesized that the GUI system will be quicker to manipulate and will provide more accurate transactions due to the field-checking features and the incorporated database.

	A	B	C	D	E	F	G	H	I	J
1	Last	First	95#	Time out	date out	item	item code	Time in	date in	late notice emailed
2	Young	Judith	951023421	3:00 PM	11/22/19	Ping pong paddle	1			23-Nov
3	laei	alonzo	951215912	7:00 PM	11/24/19	HDMI	3			
4	Grant	Harmony	951020941	7:02 PM	11/24/19	Screwdriver	1			
5	Lewis	Mary	951395184	7:30 PM	11/24/19	Dirty Dancing	1			
6	Artzo	Ashley	963284923	1:00 PM	11/24/19	Ping pong paddle	2			
7	Garbonzo	Abby	951632185	8:00 PM	11/24/19	HDMI	2			
8										
9										
10										

Figure 1: The current system in use at University Housing

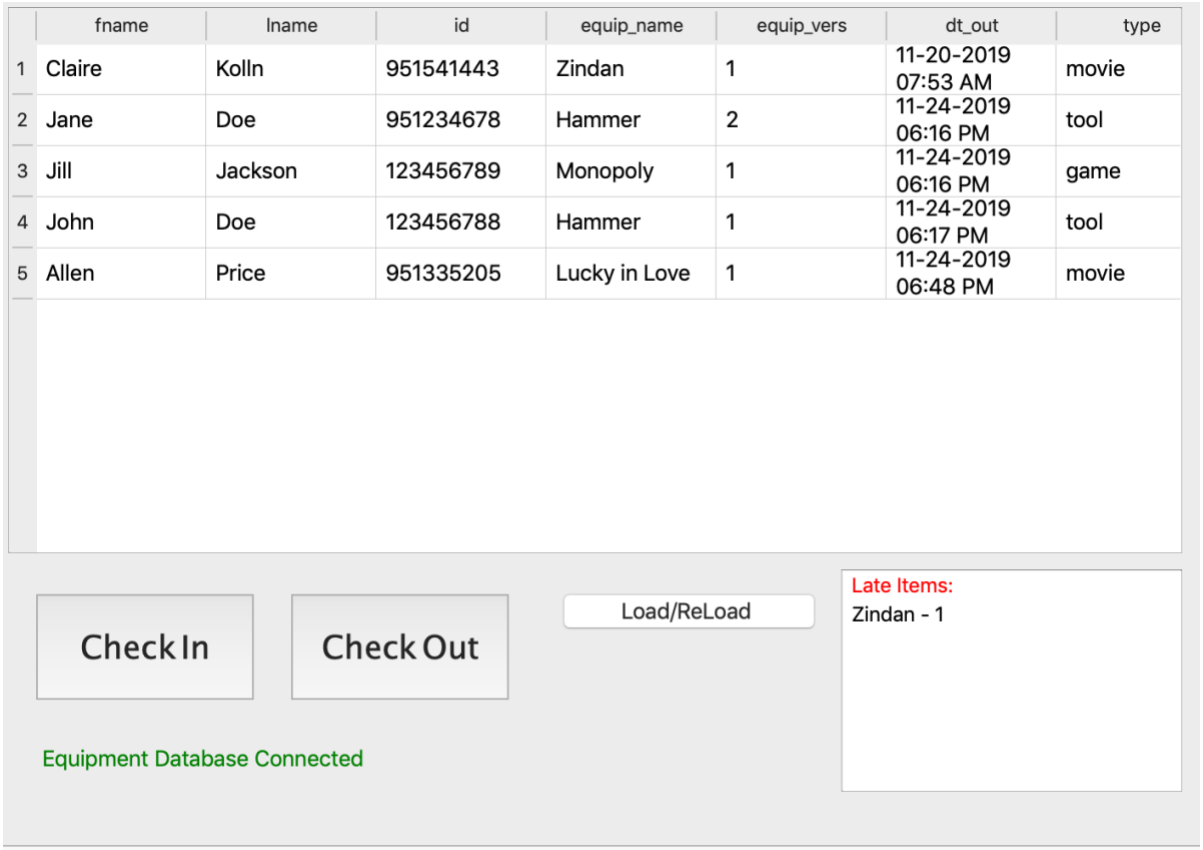

Figure 2: The new system which incorporates a Graphical User Interface (GUI)

II. Methodology – ROUGH DRAFT

Participants for the study were chosen to reflect the target user group of the systems: they are all students under the age of 23 pursuing varying degrees. Degrees include: business, mathematics, journalism, environmental studies, and accounting. Based on information collected in a pre-study survey, it is known that all participants have little to no experience interacting with equipment logs, but every participant has at least a base knowledge of Microsoft Excel. Every participant uses a MacBook as their primary machine.

The evaluations took place in a student home located off campus. The specific testing location was at a clutter-free and clean kitchen table facing a bare wall. All evaluations took place when the house was empty except for the participant and the evaluator. An effort was made to limit distractions by cleaning the area and removing all non-necessary items from the participant's view.

The materials used in the study were chosen with the intention of ease of recreation. Each evaluation took place using a 13-inch MacBook Pro with a retina display running macOS Mojave version 10.14.5. Before each block of trials, the user was presented with a set of 10

paper transaction cards which contain the operation, item, and sample student information required to complete each operation with both systems. The participants were given one card for reference containing the specific loan times for different equipment types. The evaluation was recorded using a Sony Alpha a72 and a tripod aimed at the laptop. The evaluator read from an identical testing script before and during each evaluation.

The experiment was designed to test one independent variable: two different interfaces. The interfaces being tested were a workbook of two Microsoft Excel spreadsheets versus a graphical user interface (GUI) which connects to a SQLite database. Before they began their interaction with each interface, participants were given a set of 10 transaction cards describing the operation they are supposed to carry out using the system. Each set of transaction cards tests four key system operations: equipment check out, equipment check in, whether the equipment is overdue, and whether the equipment is already checked out to another student. These operations are described in Table 1. The two systems are tested using different sets of transaction cards which vary in the order of operations to be performed and sample student information. All participants were given nearly identical systems to begin with, with some dates changed based on the day that the user was being tested. Half of the pool of participants were randomly assigned to use one system first and the other half assigned to the reverse.

Operation	How Measured	Hypothesis
Checking out an equipment item	- Accuracy: is the student information typed in correctly and the equipment item accurate to the transaction card specifications - Time from when transaction card is read to the completion of the operation	Accuracy will be higher for the GUI condition and time for completion will be faster for the excel spreadsheet condition.
Checking in an equipment item	- Accuracy: is the student information typed in correctly and the equipment item accurate to the transaction card specifications - Time from when transaction card is read to the completion of the operation	Accuracy and time for completion will be better for the GUI condition.
Discerning if an item is overdue	- Accuracy: is the participant's judgement of this condition accurate - Time from when the question is posed to when the answer has been given	Accuracy and speed will be better for the GUI condition
Discerning if an item is already lent to another student	- Accuracy: is the participant's judgement of this condition accurate - Time from when transaction card is read to when the answer is given	Accuracy and speed will be better for the GUI condition

Table 1: Operations Required by Equipment Logging Systems

Participants first read and signed an informed consent form and completed a user background survey that assessed with general background with the machine being used, their experience with equipment logging systems, and their experience working at a service desk for a university organization. The participants were then provided a high level explanation of each system which included a simplified walkthrough of the first two key system operations: Checking in equipment and checking out equipment. The participants were shown a sample transaction card (Figure 1) as an example and were told that they were to attempt to complete the operation as quickly as possible while maintaining a high level of accuracy after first reading the transaction card aloud. They were also told that they could not move on to the next transaction card until they had completed the current transaction to the best of their ability.

Over the evaluation period for each system, a total of 10 transaction cards were presented to the participant. Out of the 10, 5 transaction cards simulated check out requests and 5 simulated check in requests. Out of the 5 check out requests, 2 of the items requested were already checked out. Out of the five check in requests, 1 item was overdue. For each system, the specific information and the ordering of the operations were different to minimize the ability for the user for predict which operations will be next. The response times were measured by the analyst from when the participant read the transaction card aloud to when they moved to the next card. The user-system interactions were recorded by a video camera for later review. Following the first half the experiment, the user was given a five-minute break and offered water before repeating the same procedures with the other system.

Three threats to external validity were determined. The first threat is a possibility of selection bias in which case users may already be learned in the system being used and therefore will have a practiced hand which could invalidate the quality of the data collected. This experimental design was combatted by choosing participants with little to no experience interacting with an equipment logging system and by ensuring they only have baseline knowledge of Microsoft Excel. Another threat to external validity is that the users may learn what will be asked of them in between systems and perform better on the second block of trials, which was combatted by allowing a short break in between trials and by switching the order and information on the transaction cards. The last threat to external validity is the possibility that the experiment will not reflect the real user scenario of the intended user setting at the service desk. This threat was combatted by providing diverse information (example: not all equipment rented were movies) on the transaction cards to reflect the students that approach the Housing Service desk in the residence halls. Similarly, the user was told in advance of the experiment that they should adopt the goal of completing transactions under time and accuracy pressure to best play their role. This is reflective of a student worker completing transactions as quickly and accurately as possible when there is a line of students waiting.

III. Results

The GUI system allowed for quicker equipment check in transactions. Figure 3 shows the average time for each system for the five check in operations the users were asked to perform. The smallest margin between the two systems is at the first check in card for each system. By the fifth check in card for each system, the average times for both systems have decreased but the proposed system timing is still nearly 27 seconds faster. The minimal number of total keystrokes

and trackpad interactions necessary to complete an equipment check in for the GUI system is 4. Comparatively, the minimum number needed in the spreadsheet system is 11. Some students, especially those who marked their experience with Microsoft Excel as minimal on the pre-study survey, took over a minute to complete one equipment check in operation.

The GUI system was also quicker for checkouts except in the cases where the user was asked to check out movies from the GUI system. As shown in Figure 4, the GUI system was slower than the spreadsheet system at the first card and the fourth card. Both of those transaction cards for the GUI system were movie check out operations. It was observed during the testing block that users had difficulty finding the movie from the large dropdown list, sometimes scrolling right past the correct movie and looking further down the list. However, users spent significant time looking up the time and date of the transaction every time that they checked an item out. One user began to copy and paste the date after she realized that it was faster, but the other four had to type it in continuously as they checked items in and out.

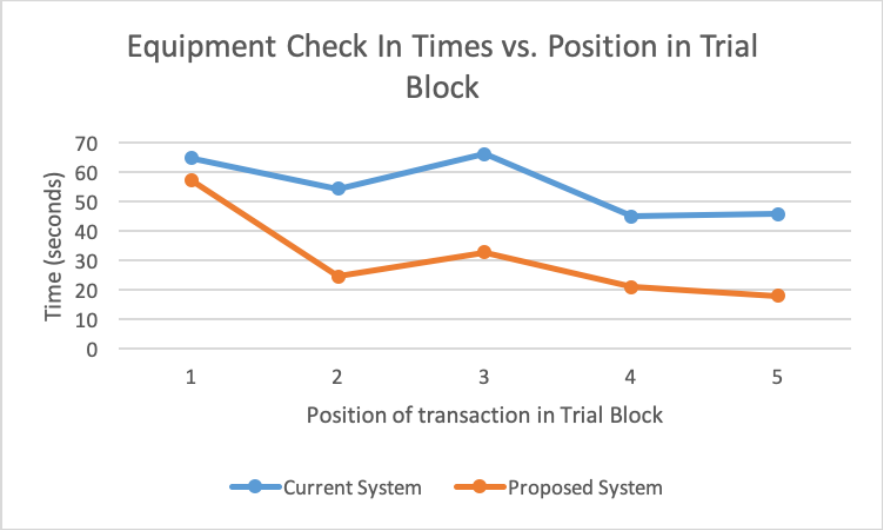

Figure 3: Equipment Check In Times vs. Position in trial block

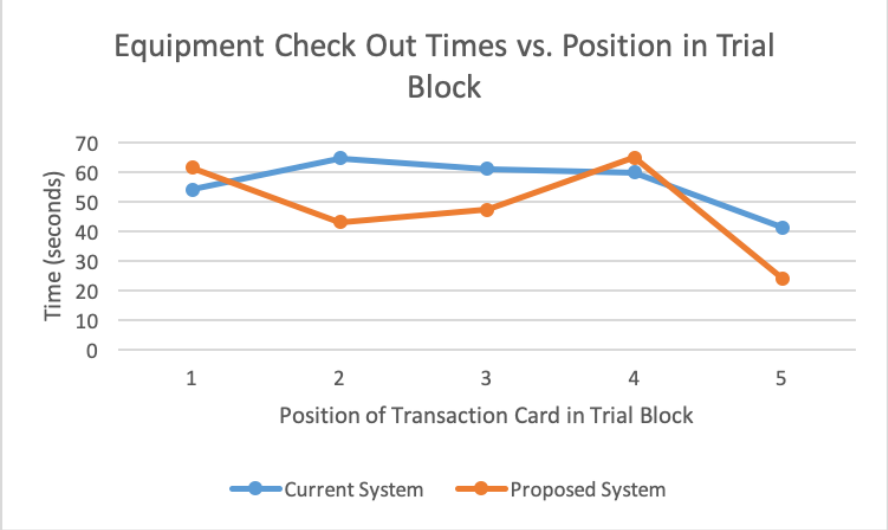

Figure 4: Equipment check out times vs. Position in trial block

It was observed during testing that it was more difficult for the users to make typing mistakes in the GUI system. Two out of the five participants incorrectly entered student identification numbers while checking out items in the GUI system and were not allowed to proceed until the field had been corrected. After seeing the error message prompting them to enter the correct student information, both students realized and fixed their mistakes. One user scrolled sideways in the spreadsheet system and cut the first two columns out of view. On the third transaction, the user realized his slip and had to backtrack to fill out the appropriate first and last names for each of the past two transactions.

Another operation tested was whether the user would be able to discern if an item was late just by using the systems. The participant was told before the test began that they were to vocally acknowledge items that were late, but many did not do so during testing. In one block of trials for the GUI system there was an error on behalf of the study coordinator in that the items had not been in the database for long enough for the system to recognize them as late, so that operation on the GUI system was not testable for one participant. However, two out of the four participants did recognize that the late on the GUI system after correctly checking the item back in. Three out of the five vocalized that the item was late for the spreadsheet system.

The final operation tested by the system was whether the user could discern if the item was in stock to loan out just by using the systems. In the GUI system, the system will not let you loan out an item if all versions of the item have been loaned out. Because of this feature, five out of the five participants noticed that there were no items in stock to loan out and declined the "transaction". Only three out of the five participants noticed that there were none left and properly declined the "transaction" for the spreadsheet system. They did so by looking up the list of items that are already checked out and counting them. However, one of the participants filled in all the cells for the operation before realizing that there were no items available. The two who did not notice seemed to have trouble with the concept of equipment "versions" in the spreadsheet system.

IV. Discussion

For some users, it was faster to type in an item name as opposed to selecting it from a drop-down list. In Figure 4, the two instances where the proposed system times are higher than the current system is when the user is asked to check out a movie. This trend suggests that the drop-down list hinders the act of quickly picking the movie that is requested. Multiple users suggested after the test that the list would be more effective if it was in alphabetical order. This modification would make it more efficient for the user to skim through the large list of movies or games.

The database is more effective in keeping track of the items that are currently out. The GUI system does not require users to input the date and time of the transaction and keeps track of that information internally. Taking this task out of the user's responsibility helped to decrease the amount of time for checking items in and out and increases the accuracy of the time collected. Similarly, when users were deciding if the item was late they had to look at both times and dates on the spreadsheet and do the mental math to arrive at their decision. The GUI system requires no excess thinking in this regard. One important improvement that could be made would be

emphasizing the late message in the GUI system. It currently displays the text “Item is late!” underneath the check in button on the check in window, but still only 2 out of the four users tested noticed and vocalized the text. If it were made bold or red colored, it would possibly be more recognizable for the user. For the user to evaluate whether there are any items left to loan out, all they must do on the GUI system is go to the checkout system and try to select the item. If it says “None available”, the item is not there. They do not have to worry about counting the items that are on the spreadsheet or trying to remember which items have 3 versions versus which items have 1 because it is all tracked in the database.

The spreadsheet system’s biggest hindrance in terms of speed is the requirement to cut and paste a row from one sheet to another. No matter what the user marked their experience with Microsoft Excel as, the average time it took for them to check an item in on the spreadsheet was still longer than the same operation on the GUI system. This highlights one of the biggest strengths of the GUI system: the minimal number of steps needed to check an item back in. One must only go to the check in window, select the item from the drop downs, and then press check in. They must know ahead of time which item version is being checked in if multiple items are checked out, which may require a quick looking back at the main window. This necessity could be diminished by putting the resident’s last name next to the item versions so it can be discerned who has checked out which item in just a glance. Overall, the GUI system is easier to use to check an item back in because it takes less time and less keyboard and track pad interactions.

V. Conclusion

This study found that the GUI system lent to better operation completion timing and accuracy among users. However, it also emphasized a few key modifications that should be made to the GUI system to make it more usable. A few changes that can be made as mentioned in the Discussion section include: alphabetizing the item lists, emphasizing the late item message, and perhaps putting the student’s name next to the item they have checked out in the check in item drop-down menu. Having multiple different users test out the product helped to highlight a few glaring oversights in the interface design.