Chicago Parking Kiosk Project

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Executive Summary

This study was conducted to evaluate the usability of the Chicago parking kiosks that appear on Chicago public streets and are owned by LAZ Parking. A team of four graduate students in the COM 525 Usability Testing and Evaluation class at Illinois Institute of Technology conducted six different tests from September to December 2010. The findings of these tests and their resulting recommendations will be explained in this summary, and each test is presented in detail in the following pages.

Methods

Our team conducted a survey to collect data on the existing attitudes towards the kiosks. We conducted eleven interview and observation sessions, which involved interviewing users about their impressions of the kiosks, observing them while they paid for parking with the kiosks, and then interviewing them again to get in-depth knowledge about their experience paying for parking. A participatory design test was presented to each interviewee at the conclusion of the interview. This test consisted of users creating their own kiosk interface by rearranging the features of the existing interface and therefore showing our team their version of an intuitive walk-up-and-use kiosk. A heuristic evaluation was performed to compare the tasks involved with paying for parking to a list of qualities found in usable systems. We also performed a cognitive walkthrough to assess the likely success of each step involved in paying for parking.

Results

The tests provided many insights into the triumphs and challenges of paying for parking. The most common and most serious usability problems were found to be the following:

- Three of the eleven users we observed were unable to complete the task as they quit before the transaction had been completed.
- Users had trouble converting the amount of time they wanted to park to the amount of money they needed to spend.
- Users felt the instructions were confusing. Instructions are placed at various locations on the kiosk interface. Some instructions appear on screen; others do not.
- Users did not know when the receipt was done printing.
- Many pieces of the kiosk were not logically placed.
- Users liked the convenience of being able to pay with a credit card.
- Users did not know which way to properly insert a credit card.
- Users felt the maximum amount of time allowed by the meters was insufficient.
- Users did not know about the perforated stub they could tear off from the receipt and keep with them to remember when their parking time was up.
- Although the LAZ Parking arrangement with the city is not a usability issue per se, many survey respondents expressed their frustration with the deal.

Recommendations

- Redesign the kiosks to improve satisfaction and allow all users to complete the task of paying for parking.
- Re-label the value buttons so they display both the amount of money one is paying and the amount of parking time they will receive, or display only the amount of time being credited and let the screen show the amount of money being spent.
- Streamline the instructions. Put all of the instructions in the same place, and show more of the instructions on the screen.
- Add visual and/or auditory cues to inform the user of when the receipt has been printed.
- Provide a more effective diagram to show users how to insert their credit card.
- Increase the maximum amount of parking time allowed.
- Provide instructions to inform users of the opportunity to tear off the part of the receipt that shows them when their meter will expire.

A visual representation of our recommendations is below.

The fact that the kiosks accept credit cards was the most positive change reported by users, who find credit cards to be more convenient and readily available than coins.

Users requested the ability to park for longer than currently allowed.

Users were aware of the consequences of not paying for parking and therefore felt this warning did not need to be as prominently displayed.

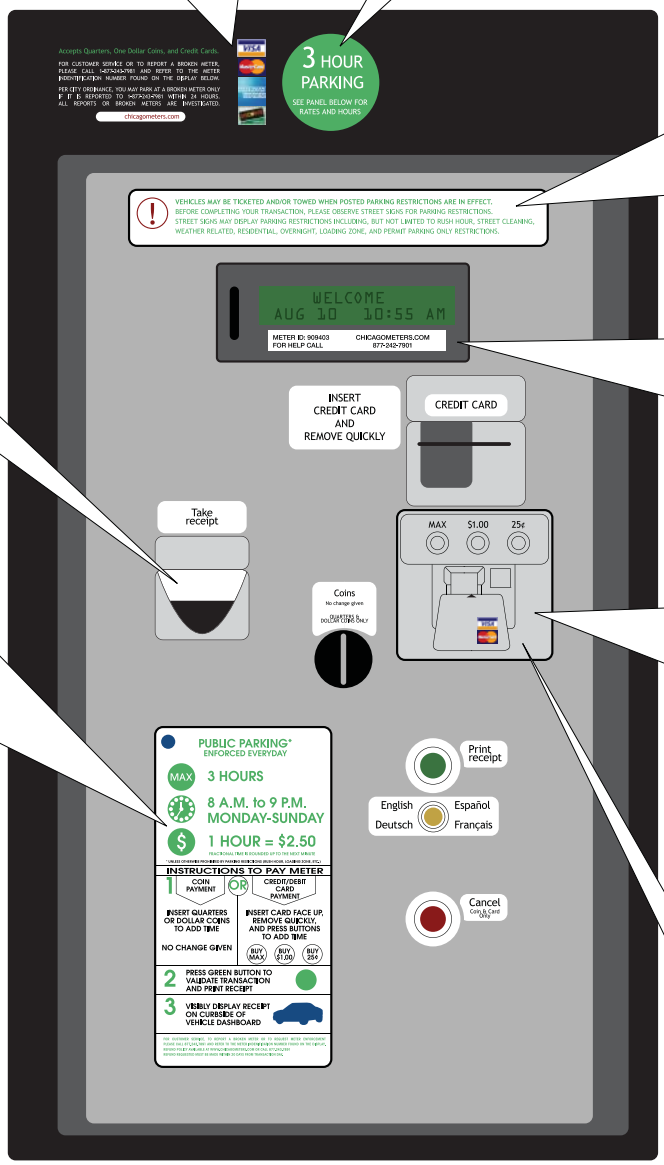
Some users were not sure when the receipt was done printing. A visual or auditory cue could be added to increase awareness.

Users felt the screen was underutilized and could be used to streamline the instructions.

The instructions panel was found to be useful, but users wanted it more prominently displayed. Many expected to see the instructions next to the screen, with the time to dollars equation next to the value buttons.

Several users wanted the value buttons to display the amount of time they would add in addition to the dollar amount. An indication of the max time associated with the "max" button was requested.

Users did not know which way to insert their credit card. A clearer diagram is recommended.



Research Conducted
Survey

Executive Summary
As part of the overall goal in evaluating the usability of the Chicago parking kiosks and identifying key opportunities for improvement, an online survey was administered. The survey was written to help generate statistical data that would explain users' overall likes and dislikes, kiosk preferences, and other general attitudes. The survey was taken by 47 individuals, 39 of whom had used the current Chicago parking kiosk system. Those who indicated they had used the current Chicago parking kiosk were asked a series of questions regarding their experience with the system, while those who hadn't used the system were asked about their general experience with other self-service kiosks.

While users were generally satisfied with the use of the Chicago parking kiosks, there were still areas in need of improvement. For instance, users commented that the maximum time allowed at the kiosk was too short, and the time it took to complete a transaction was too long. Additionally, it was found users who understood the history of the city of Chicago leasing the kiosks to a private firm are still resenting the transaction.

The actual online survey can be found at http://bit.ly/parkingkiosk. The questions and rationale can be found in Appendix A. The results to the online survey can be found in the attached file titled "results.xls."

Methods
The first step of this project was to administer an online survey to a convenience sample of Chicago area residents. The respondents were offered a chance to win a $20 Amazon gift card in exchange for taking the survey and providing their e-mail address. Google's survey application was used to create the survey and collect the survey data.

Although the statistical data derived from the online survey revealed a variety of insights, a few key questions were answered. The answers to these questions were determined to be most helpful in guiding user experience designers in the Chicago parking kiosk redesign.

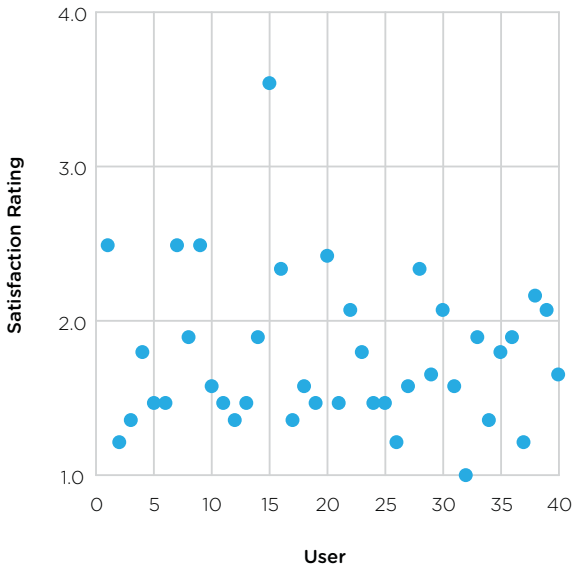
The key questions were the following:

- What was the overall satisfaction of the users when recalling their use of the Chicago parking kiosk?
- What were some of the common problems experienced by users when using the Chicago parking kiosk?
- Were the users satisfied with the time it takes to pay for parking?
- Which method of payment did the users prefer?
- Which self-service systems are easiest to use?

Results
1. What was the overall satisfaction of the users when recalling their use of the Chicago parking kiosk?
The overall satisfaction of the users was measured using a Likert scale that had four responses: Never (had a problem), Rarely (had a problem), Sometimes (had a problem), and Always (had a problem). It was surmised that users who never had problems with the Chicago parking kiosks had a higher level of satisfaction, although we acknowledge that it is possible for a user to never have problems using the kiosk, but at the same time to be truly indifferent, or even have a low satisfaction.

Before the test was run, a value of "1" for Never, "2" for Rarely, "3" for Sometimes, and "4" for Always were assigned. The highest possible satisfaction rating would be a 1.0, and the lowest possible satisfaction rating would be a 4.0 (10 questions with 4 different response variables). If a user received a 1.0, he or she would be considered extremely satisfied with the Chicago parking kiosks.

The overall satisfaction ratings were calculated, and it was found that the median was 1.6.



On a scale of 1.0-4.0, a median of 1.6 would suggest that a large number of users may be highly satisfied with the Chicago parking kiosks. On the other hand, users could be so used to using the Chicago parking kiosks that they assume they are genuinely satisfied, or they expect no better.

2. What were the common problems experienced by users when using the Chicago parking kiosk?
In the survey, users were presented with a list of known problems with the Chicago parking kiosk. The common problems experienced by users was measured by using a Likert scale that had four responses: Never (had a problem), Rarely (had a problem), Sometimes (had a problem), and Always (had a problem).

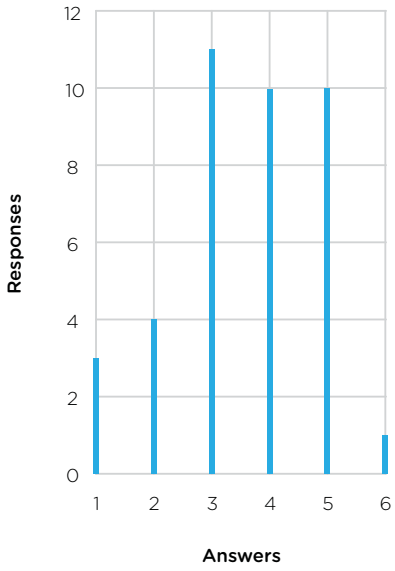
Before the test was run, a value of "1" for Never, "2" for Rarely, "3" for Sometimes, and "4" for Always were assigned. The mean (average) of each problem was then calculated. The higher the mean, the more often the users reported experiencing the problem. As the table below shows, on average users did not experience problems using the kiosk very frequently.

	Problem with kiosk	**Mean**
1.	Maximum meter time was too short	2.64
2.	Had to walk farther than desired to get to kiosk	2.41
3.	Didn't know if you had to pay for parking	1.92
4.	Didn't know where to pay for parking	1.89
5.	Had difficulty reading instructions	1.71
6.	Didn't remember how to use the system	1.64
7.	Kiosk was out of order	1.64
8.	Your payment wasn't accepted	1.51
9.	Received a parking ticket because an error was made using the parking kiosk	1.20
10.	Didn't receive a receipt when expected	1.12

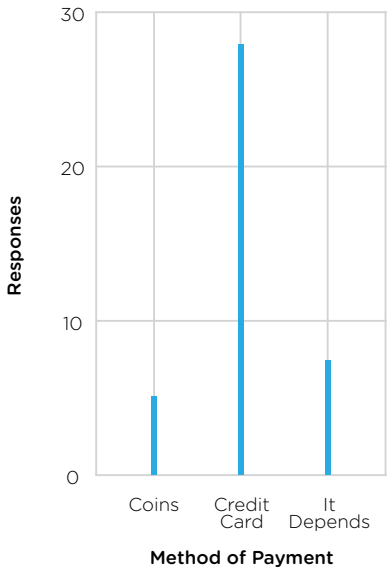
Satisfaction Rating

3. Were the users satisfied with the time it takes to pay for parking?
In the survey, users were asked how satisfied they were with the time it takes to pay for parking. The question had an Likert scale of "1" for least satisfied to "6" for most satisfied.

The mean was 3.58, which means that 3.58 was the average satisfaction score. The mode was 3, which means that a rating of 3 was the most common rating given by all surveyed users. The median was 4, indicating that half of the answers were above 4 and half were below 4. These results show that users were satisfied with the time it takes to pay for parking, but not very satisfied.

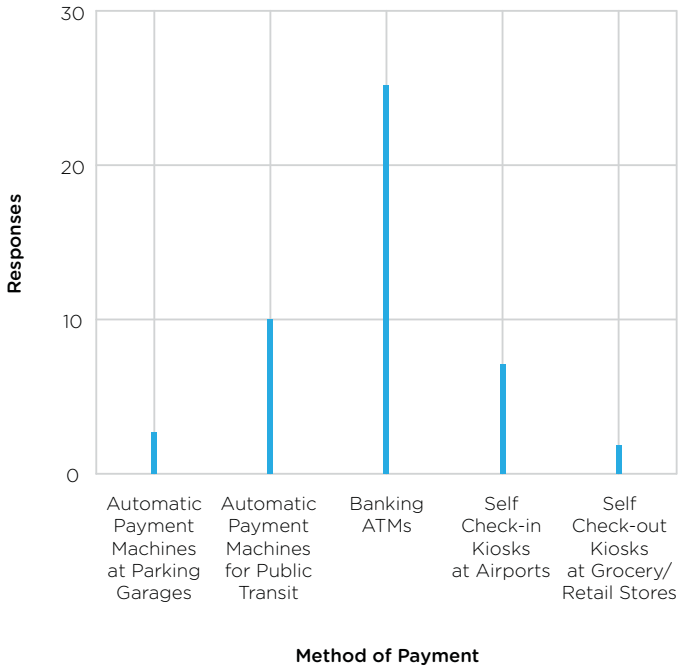


4. Which method of payment did the users prefer?
In the survey, users were asked which method of payment they preferred to use at the Chicago parking kiosk. 13% of respondents prefer coins, 69% prefer credit cards, and 18% said "it depends." When prompted, coin and credit card users cited "convenience" as the reason they prefer their respective method of payment.



5. Which self-service systems are easiest to use?
In the survey, users were presented with a list of self-service systems: automatic payment machines at parking garages, automatic payment machines for public transit, banking ATMs, self check-in at airports, self check-out kiosks at grocery/retail stores, the current Chicago parking kiosks, and the old Chicago parking meters.

53% of the respondents said banking ATMs were the easiest to use.



The key questions yielded the following insights. Clearly, a high level of overall satisfaction existing among the users of the survey. Of the most common problems reported, it was shown that users believed maximum meter time was too short, they had to walk farther than desired to use a kiosk, they didn't know that they had to pay for parking, and they didn't know where to pay for parking. Users were neither particularly satisfied or dissatisfied with the time it takes to pay for parking. Most users pay with a credit card, mostly out of convenience. And, the majority of users believe that ATMs are the easiest to use out of all the self-service systems that were listed.

Additional results from the survey suggest the following:

- The most cited problem experienced by the users is that the maximum time allowed was too short.
- When street parking, one-third of the users avoid areas covered by Chicago parking kiosks.
- Of other self-service systems, grocery or retail self-checkout systems were said to be the most difficult to use.
- A significant number of respondents have a negative opinion of the corporation that owns the Chicago parking kiosks.
- There is no correlation between a user's age and how easy he or she perceives the Chicago parking kiosk to use.
- There is no correlation between a user's area of residency and how easy he or she perceives the Chicago parking kiosk to use.

Recommendations

The information derived from the analysis of the survey data revealed much. Although this particular survey wasn't designed to identify specific, finely detailed problems, enough information was created to recommend general focus areas.

Based on the analysis of the survey data, it is recommended to:

- Increase the maximum time allowed in the Chicago parking kiosk
- Decrease the amount of time it takes to use the Chicago parking kiosk
- Analyze and compare the interface and process of banking ATMs
- Improve the company image of LAZ Parking, the owner of the Chicago parking kiosks

Increasing the maximum time would eliminate a significant frustration point indicated by users. Analyzing banking ATMs could generate insights for how to decrease the amount of time it takes to pay for parking and to improve the experience. Lastly, improving the company image of LAZ Parking could help users of the kiosks feel less resentful about the deal between the city and the corporation.

Research Conducted
Observations and Interviews

Executive Summary
Observations and interviews of eleven users revealed the following:

- Eight users successfully completed the task of paying for parking. Three users were unsuccessful.
- Users appreciate the convenience of being able to pay with a credit card.
- Many users found the elements of the kiosk interface (display screen, payment slots, instructions, and buttons) to be confusing and not logically placed.

The parking kiosks, as walk-up-and-use systems, should require little effort from users to understand. Additionally, users should rarely or never fail to complete the process. In this regard, the fact that many users found the interface and directions confusing and that three users were unsuccessful in their attempt to pay for parking is troubling. However, users offered many recommendations to improve the usability of the parking kiosks, which are detailed in the recommendations section at the end of this section.

Methods
As stated in our project plan, our goals in conducting the user observations and interviews were to explore the following:

- Evaluate how novice users use a Chicago parking kiosk to pay for parking.
- Determine which parts of the process are difficult or frustrating for novice users.
- Identify potential areas for improvement.

Our focus on novice users stemmed from our belief that by interviewing and observing novice users we could identify issues that more experienced users may have become desensitized to or have learned to work around.[1] We also anticipated that by improving the usability of the kiosks for novices we would be able to improve the experience for all users. Finally, since the kiosks are true walk-up-and-use systems they should require no learning time. This fact would guide our thinking during the kiosk redesign.

Our sessions with users began with a pretask interview, continued with the observation, then a post-task interview, and concluded with the participatory design.

Observations
At the beginning of the observation we asked users to use a parking kiosk to purchase time to park. To help conduct the observation, the observer relied on the guidelines our group developed in our project plan (Appendix D of the project plan). Additionally, the observer had the option of using a checklist our group developed to aid in the observation (Appendix B of this report). Our group developed this checklist after we noticed that the process of paying for parking went very quickly (most users took only 30 seconds to 1 minute to complete the process) and it was hard to note all of the user's actions and behaviors. The checklist offered an efficient way to record the details of the observations.

Interviews
The interviews were designed to get more information from users regarding their actions during the observations and probe users' opinions on the parking kiosks. We structured the interview as an hourglass, beginning with general questions, moving to more specific questions, and then broadening out the interview again to elicit general opinions from participants regarding the experience of paying for parking and using the parking kiosks.[2]

Results
A table containing our notes from the observations can be found in Appendix C of this report. A table containing our notes from the interviews can be found in Appendix D of this report.

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1 Our goal to observe and interview only novice users was hampered by the time constraints of the project and by the necessity of finding participants quickly. As a result, only three of our participants were true novice users.
2 The idea for the hourglass structure came from Kuniavsky, *Observing*, chapter 6; similar ideas are explored in the "debriefing guidelines" given by Rubin and Chisnell, *HUT*, 231-235.

Observations
Users we observed encountered some of the issues below when attempting to purchase parking:

- User was unsure if he made an error because of the long time it took to print the receipt.
- User did not initially lift up the plastic flap that covered the credit card reader; had trouble figuring out how much value to add to the meter.
- User originally planned to pay with a dollar bill before realizing bills weren't accepted.
- User complained that the green "print receipt" button was obscured by the plastic cap covering the button.
- User didn't know if he needed a receipt.
- User didn't know what to do with the receipt.
- User took longer than expected to press value buttons.
- User complained of unhelpful and confusing instructions.
- User complained of a lack of a hierarchical structure showing the step-by-step process required to pay for parking.
- User complained of randomly placed buttons.
- User didn't know how the kiosk knew how much money she wanted on the card.
- User took longer than expected converting the cost to time.
- User placed credit card in backwards.
- User quit the process out of frustration.
- Process cancelled because of user error.

Additionally, we observed the following user behaviors:

- Finger wandering around the interface.
- Squinting at the screen.
- "Frustrated" behaviors (sighing, raising hands in frustration/questioning gesture).
- Leaning down to view the color of the buttons that were obscured by plastic caps.
- Swearing at self, swearing at machine.

Of eleven total participants, eight successfully completed the task and paid for parking. Three were unsuccessful. Users who were most familiar with the kiosks and had used them before were the most comfortable.

In particular, users stumbled while attempting to perform the following actions:

- Choosing how much time to select.
- Knowing what to do with the receipt.
- Waiting for the receipt (i.e., users thought they had made an error because it took so long to print the receipt and the machine's instructions were unclear).
- Learning how to use the machine by reading the paper instructions.
- Tearing off the perforated portion of the receipt.

On the other hand, users appreciated the fact that the machine allowed them to pay with credit cards even if they couldn't pay with dollar bills.

Interviews
The interviews we conducted with users allowed us to gain a fuller understanding of what we noticed during the observations, as well as ask users for their opinions regarding using the parking kiosk.

In general users have very diverse views on using the parking kiosks. For example, some users liked the buttons and found them easy to use; others didn't. Some found the instructions helpful, and others didn't. However, some generalizations can be made from the interview data. In general, users liked being able to pay with credit cards and found the experience of using a parking kiosk to pay for parking more convenient than using the old parking meters. On the other hand, users didn't like some elements of the interface, including the display screen, and thought that the paper instructions could be clearer. A selection of comments and quotes from users is provided in the following table.

Topic or Interface Element	Comment
Using kiosks versus using old parking meters	Overall a positive improvement over meters. (Steve) "Easier than old-fashioned meter." (Dave)
The process of paying for parking	Thinks the instructions "could be clearer…it's not immediately clear what you need to do, like at an ATM." (Dave) Most confusing thing was the pricing. Thrown by the fact that 48 minutes = $1.00. (Dan) "Hours of operation, time limit and price. Those are the things I need to know upfront." (Pete) Major concern was trying to figure out was much time cost. (Jamie)
Coin slot	Coin slot should be highlighted so you know where to put your coins. (Dave)
Buttons	Wants buttons to say both how much time they gave and how much they cost. . . . Ok, I know how much money I'm using but how much time am I buying?" (Dan) "It says max here. What does that mean, max time or max money? I guess they're the same but I had to think that through." (Dan) "I liked the big buttons." (Dan) Value buttons are very intuitive. (Pete)
Display screen	"[Display screen] could have been brighter. It's just black on grey." (Steve) Display is pretty easy to read, but you "don't immediately know that's what you should be looking at." (Dave) Wants a color touch screen. (Matt) Current screen looks "ancient." (Pete) Should be larger. (Pete) Hard to read because of the glare from the sun. (Jamie)
Paper instructions	Located too low. (Stephanie) "[I] didn't have time to read the instructions, because they looked like it would take too long." (Jackie) Confused by the placement of the graphics. (Eva) Should be at the top of the machine. (Eva)
Receipt	"Where will receipt come out?" (Dave) "There was a moment where it said 'take receipt' but then it looked like it was still printing so I wasn't sure when to take the receipt." (Dan)
Other comments	"It's convenient cause I didn't have any quarters with me but expensive. Used to be 25 cents/hour, now it's $1.25/hour." (Kristen) Maximum time allowed is too short; the kiosk should allow more time for running errands. (Steve) Would prefer a side-swiping credit card slot over the front-loading reader the kiosks have now. (Matt) Feels the city should have gotten a better deal from LAZ Parking and that the meters should be owned by the city. (Matt) Likes using his credit card because he gets points on the card. (Pete) Felt tall for the machine. (Stephanie) Annoyed that he had to walk roughly 25 yards to use the meter. (Matt) Interface's elements should be condensed. (Jackie) Interface's elements should be placed in a step-by-step hierarchy. (Eva)

Recommendations

Based on the results from the user observations and interviews, we recommend the following to make the parking kiosks more usable:

Make it more obvious to users the steps required to pay for parking and their order.
Users often had difficulty determining where to start; some users didn't know to expect a receipt at the end. Suggestions include using the interface to guide users by including arrows and numbers, moving the instructions up to the upper-left-hand corner so they're more visible, or enhancing the display screens so they're more like bank ATMs or airport check-in machines.

Make the most important elements of the interface more visible.
The payment slots (credit and coin) should be more visible because that's where users begin the process of paying for parking; the "print receipt" button should be more visible because that's how users conclude their transaction. (Users were generally happy with the visibility of the payment buttons.) Suggestions include making the payment slots more visible by adding arrows or otherwise indicating their importance and moving the "print receipt" button up or increasing its size to make it more visible.

Add a visual or auditory cue when the receipt is done printing.
In addition to making elements of the interface more visible, it's important to alert users when they have completed the task. Sometimes the fact that the receipt has printed can be lost on users. A visual or auditory cue will signal to users that the transaction has completed.

Make the overall experience of paying for parking more user-friendly.
Users appreciated the convenience of being able to pay with credit cards but were otherwise unsatisfied with the experience of paying for parking. Users cited bank ATMs and airport check-in machines as user-friendly devices because of their large touch screens and simple, clear directions. We understand large touch screens may not be an option because the parking kiosks are solar powered; however, LAZ Parking can do more to improve the user-friendliness of the parking kiosks. Suggestions include bringing back free days recognized by the old parking meters (holidays and Sundays), reducing the amount of money charged for parking, increasing the amount of kiosks per block to reduce wait times or to reduce the distance required to walk to the kiosks, and increasing the allowable amount of time available to purchase by customers or allowing customers to purchase additional time remotely (see the ParkMagic system discussed in Ed's survey results write-up; additionally, one of the users [Peter] cited an iPhone app in his interview but it is unclear whether there is anything currently available [user 6, Appendix D]).

Research Conducted
Participatory Design

Executive Summary

The participatory design test consisted of eleven users providing their versions of what the parking kiosk should look like by rearranging paper representations of each of the pieces of the kiosk interface. Commonalities between the designs resulted in the following conclusions:

- The screen should be larger and located on the left hand side of the kiosk, and in the top third of the interface.
- The instructions should be moved up so that they are next to the screen.
- The credit card slot and coin slot should be next to each other.
- The receipt dispenser should be located at the bottom of the interface.

Method

The participatory design test is based on the concept that everyone is a designer, everyone has a sense of what looks good and feels intuitive.[3] Our team chose to run this test on the Chicago parking kiosks because the kiosks are walk-up-and-use systems, so an intuitive, easy to learn interface is essential to their usability and the overall satisfaction of the users. The participatory design test can give us a sense of what users expect to see when they walk up to the kiosk.

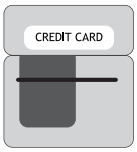
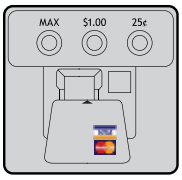
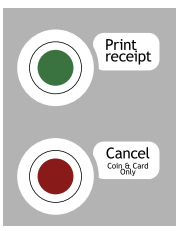
3 Wilson, *UXR*, 140.

A test was conducted at the end of each of the eleven interview and observation sessions conducted by our team. Users were given paper cut outs of each of the pieces that appear on the kiosk interface (the screen, the instructions, the print receipt and cancel buttons, etc) and a blank canvas. We instructed the participants to arrange the pieces on the canvas to represent what they thought would be the ideal kiosk interface layout. Participants were encouraged to use the "talk aloud" method, which involved talking through their thoughts and rationales regarding the decisions they made during the test. We also gave them the option to mention any other changes they would make that couldn't be represented by the cut outs, such as changing the size or color of a feature or adding or removing pieces. Once the participants completed their design, our observer noted any comments they made during the test and took photos of their design.

One member of our team then viewed all of the design results and notes, looking for commonalities between the designs. Though it is unlikely that any one user would come up with the perfect kiosk design, if several users placed an element in the same place, there is a good chance that placement would represent what most most users would find logical.

Results

Kiosk Piece	Description	Results
Broken meter instructions 	Informs users of accepted methods of payment and what to do if the meter is broken.	7 of 11 users put the broken meter instructions on the top of the kiosk, where they are located on the current kiosk design. After reading the text, one user requested "Broken Meter?" be written in large text at the top. Two users suggested the credit card symbols be located next to the credit card reader.
Max time indicator 	Informs users of the maximum amount of time they can purchase at the kiosk.	10 of 11 users kept this piece at the top of the kiosk. 6 users kept this icon centered in the middle of the top of the kiosk, with the remaining users putting it either top left or top right.
Warning about not paying for parking 	Informs users of the consequences of not paying for parking.	Users were evenly divided between placing this near the top of the kiosk (its current location) and placing it at the bottom of the interface. Two users expressed that they knew the consequences of not paying for parking and could not understand why it was displayed so prominently in the current design.
Screen 	Informs user of system status, amount of time and money paid for parking.	All 11 users placed the screen in the top third of the kiosk. 7 users placed it in the left side of the kiosk, and the remaining four placed it to either the right or center. Three users requested the screen be made bigger.

Credit card slot 	Users insert their credit card into this slot to pay for parking	All 11 users placed the credit card slot in the middle third of the kiosk. 9 of 11 users placed the credit card slot right next to the coin slot, and the remaining two users put the credit card slot directly above or below the coin slot.
Value buttons 	Users press these buttons to add time to their parking. The diagram shows how to properly insert a credit card.	8 of 11 users placed this piece below the credit card slot. 4 of those 8 placed the value buttons directly below the slot, while the remaining 4 either put the the “insert credit card here” indicator between the two or placed the value buttons below and slightly to the left of the credit card slot. One user suggested the value buttons be separated from the credit card diagram.
Coin slot 	Users insert coins into this slot when paying for parking.	9 of 11 users placed the coin slot next to the credit card slot. The remaining two placed it either directly above or directly below the credit card slot.
Receipt dispenser 	When the transaction is complete, a printed receipt appears in this slot. Users take the receipt and place it on their car’s dashboard.	8 of 11 users placed the receipt dispenser in the bottom third of the kiosk. Users were evenly divided on whether it should be placed on the bottom right, bottom center or bottom left.
Instructions 	Informs users of how to pay for parking, provides conversion rate between time and money and reiterates the maximum amount of time one can purchase and what to do if a meter is broken.	9 of 11 users placed the instructions in the top two thirds of the kiosk. Of those 9, 3 placed it at the very top of the kiosk and 6 placed it in the middle third of the kiosk. Users evenly distributed the instructions on the left or right hand side. 9 out of 11 users placed the instructions close to the screen.
Language selector 	Allows users to change the language displayed on the screen.	6 of 11 users placed this button near the print receipt and cancel buttons. The 5 remaining users placed the button directly above the screen.
Print and cancel buttons 	The green print receipt button ends the transaction and prompts the kiosk to print the receipt. The red cancel button allows users to cancel the transaction before it is completed.	All users placed these buttons within close proximity of each other. 9 of 11 users placed these buttons on the bottom third of the interface. 6 of 11 users placed one button directly on top of the other, 3 placed them side by side, 2 placed them in a triangular formation with the yellow language selector button. The users that placed one button directly on top of the other were evenly divided on whether the print or cancel button should be on top.

Two users offered additional suggestions that cannot be represented through the preceding table. Matt suggested a touch screen design, where all of the instructions appeared on the screen. Users could increase or decrease either the amount of time they are paying for or the amount of money they want to spend. The print receipt and cancel buttons would also appear on this screen. A credit card reader, coin slot and receipt dispenser would also be present. Dave presented a design that featured a series of arrows that would help the user navigate from one part of the interface to the next.

Recommendations
Commonalities between the participatory designs suggest significant changes that can be made to the kiosk interface to enhance its usability.

- The broken meter instructions and max time indicator should remain at the top of the kiosk interface.
- The warning about not paying for parking can either remain on the top of the interface or be moved to the bottom.
- The screen should remain at its current level but should be moved to the left hand side of the interface. The screen should also be larger.
- The credit card slot should be directly next to the coin slot, with the value buttons placed directly beneath the credit card reader.
- The receipt dispenser should be moved to the bottom of the kiosk interface.
- The instructions should be moved to the middle third of the interface and be located right next to the screen.
- The print receipt and cancel buttons should be kept together, and the language selector button could be either kept in line with the print receipt and cancel buttons, or moved closer to the screen.

Our team created a diagram (Appendix E) to exemplify these changes. When data was inconclusive or conflicting, our team made decisions based on the results of our other usability tests or our evaluator's knowledge of usability and design.

Research Conducted
Heuristic Evaluation

Executive Summary
Our team conducted a heuristic evaluation of the parking kiosks, comparing the system interface with a list of heuristics. The kiosks feature relatively simple interfaces, so each step involved in using the kiosk is essential to its usability, which is why an in-depth examination of each of the functions was appropriate. We noted five positive fulfillments of heuristics and ten violations, two of which were major. The most frequently fulfilled heuristic was "Visibility of System Status," and the most frequently violated heuristics were "Consistency and Standards" and "Help and Documentation." We recommend building on the strength of the on-screen instructions and overcoming these violations by adding more instructions to the screen, consolidating the written instructions on the machine, relabeling the value buttons, and redesigning the receipt.

Methods
For our heuristic evaluation, we used Jakob Nielsen's well-established list of ten heuristics:

Nielsen's Heuristics[4]
- Visibility of System Status
- Match between System and Real World
- User Control and Freedom
- Consistency and Standards
- Error Prevention
- Recognition Rather than Recall
- Flexibility and Efficiency of Use
- Aesthetic and Minimalistic Design
- Help Users Recognize, Diagnose, and Recover from Error
- Help and Documentation

4 Nielsen, *Usability*.

In our analysis we considered all of the heuristics; however, we considered some to be especially relevant to the success of the parking kiosk system. Take for example the second heuristic, "Match between System and Real World." Because the parking kiosk is a walk-up system, we cannot expect users to learn a specific system vocabulary, so the terminology used in the instructions and prompts should be obvious and familiar to users. Two other particularly relevant heuristics are number three, "User Control and Freedom" (emphasizes the ability for a user to "undo" a previous action) and number five, "Error Prevention" (because the consequences of making an error with the parking kiosk could involve an expensive parking ticket, it's important that the system guard against such errors and allow the participant to correct mistaken actions, such as choosing too little time).

Nielsen has found that one evaluator tends to identify only 20 to 51 percent of usability problems through heuristic evaluation, but when multiple evaluators aggregate their results, many more issues are found. Therefore, we followed his recommendation of using three to five evaluators.[5] One team member developed the task descriptions, performed the initial evaluation, and then aggregated the evaluations of the rest of the team.

Results

During the evaluation, each heuristic violation was assigned a rating from the table below.[6] (Components of the task that fulfilled a particular heuristic or had no violations were noted as "Good.")

Good	Indicates that an object is well designed.
Minor	Minor nuisances that encumber the user during the task, such as users having trouble finding the correct command or controls to complete the task. They leave the user frustrated and dissatisfied with the product.
Moderate	Significant problems caused for the user. A common type of this error includes using an incorrect control, or using the correct control, incorrectly. These errors typically account for a high incidence of support requests.
Major	The most critical level, where the user is unable to correctly complete their task. A common type of this error is when the user simply cannot determine which controls, information, or sequence is necessary to complete the task. Products should never be delivered with any critical level errors.

The aggregated evaluations of the team are recorded in the table that follows.[7]

5 Nielsen and Molich, "Heuristic", 249–56.
6 Table taken from Scollan, Byrnes, Nagle, Coyle, York, Ingram, "Drupal", 9.
7 The format of this table is derived from Wilson, *UXR*, 351,353.

Task Description	Heuristic Fulfilled	Heuristic Violated	Usability Issue Description	Inspector's Comments Regarding the Usability Defect	
1. Read printed instructions on kiosk. *Screen:* WELCOME (date) (time)		Help and Documentation	Printed instructions are positioned in three different areas of the interface.	Users may not notice all the sets of instructions and/or may not know which to read first.	Minor
		Consistency and Standards	After a user begins to use the kiosk, the screen provides the majority of instructions, but at this point, it offers no assistance.	To help the users start the task, the screen should provide instructions as it does for the remainder of the task.	Moderate
		Consistency and Standards	One set of instructions shows the VISA, Mastercard, American Express, and Discover logos, while another shows only the VISA and Mastercard logos.	Depending on which set of directions the user looks at, he or she may not realize that an American Express or Discover card would be accepted. This could lead a user with one of those cards to be unable to complete the task.	Major
2. Lift flap that covers credit card reader. *Screen:* WELCOME (date) (time)		Help and Documentation	There are no instructions that direct the user to lift the flap.	Although a user who tries to insert his/her card without lifting the flap will quickly realize the necessity of doing so, a written instruction ("Lift") on the clear flap would be helpful.	Minor
3. Insert and remove credit/debit card.[8] *Screen (once card is swiped):* VERIFYING CARD	Visibility of System Status		The screen changes in response to the user's action.		Good
4. Read on-screen instructions. *Screen:* PAY WITH VALUE BUTTONS	Visibility of System Status		The screen changes to instruct the user what to do next.		Good
		Consistency and Standards	The "value buttons" are not labeled "value buttons." They are instead labeled "MAX", "$1.00", or "25¢".	The buttons should be labeled consistently with the instructions given.	Minor

8 Because our survey participants overwhelmingly chose credit cards as their preferred method of payment (versus coins), we based the task description on the steps a credit card user would go through to pay for parking.

Task Description	Heuristic Fulfilled	Heuristic Violated	Usability Issue Description	Inspector's Comments Regarding the Usability Defect	
5. Choose time by pushing "MAX", "$1.00", or "25¢" buttons. *Screen (once a button is pressed):* PAID hh:mm EXPIRES $x.xx xx:xx xx:xxa/pm	Flexibility and Efficiency of Use		The "MAX" button can be considered an accelerator for users who know what it is.		Good
	Visibility of System Status		The screen indicates how much time and money have been added.		Good
		Consistency and standards	The buttons mix time ("MAX") and money ("$1.00" and "25¢").	It may not be immediately clear to users that these buttons are all for the same purpose of choosing how much to charge to their card, and that they can choose to use the "MAX" button or use a combination of the "$1.00" and "25¢" buttons.	Moderate
6. Press "Print receipt" button. *Screen:* PAID hh:mm EXPIRES $x.xx xx:xx xx:xxa/pm		Help and Documentation	The screen does not provide a prompt to remind the user to print a receipt.	Usually the screen instructs the user of the next step in the process. Here, it's assumed the user will know when he or she is finished choosing the time and that it's time to print the receipt, or that he or she will look away from the screen and seek out the printed instructions on the kiosk.	Minor
7. Wait for receipt to print. *Screen:* PLS WAIT FOR RECEIPT TO DISPLAY ON DASH *Then:* CONTACTING BANK FOR AUTHORIZATION *Then:* PLS WAIT FOR RECEIPT TO DISPLAY ON DASH		Match Between System and the Real World	"CONTACTING BANK FOR AUTHORIZATION" — an activity seemingly unrelated to printing a receipt — displays after "PLS WAIT FOR RECEIPT TO DISPLAY ON DASH."	While the initial message is helpful, the message about authorization may confuse users since "VERIFYING CARD" already occurred after the card was swiped. Users may not be aware of the difference, or that "CONTACTING BANK FOR AUTHORIZATION" actually means this is the moment their credit card is being charged.	Minor

Task Description	Heuristic Fulfilled	Heuristic Violated	Usability Issue Description	Inspector's Comments Regarding the Usability Defect	
8. Take receipt. *Screen:* TAKE RECEIPT DISPLAY ON DASH	Visibility of System Status		The screen changes to instruct the user what to do next.		Good
9. Tear off stub from receipt. *Screen:* WELCOME (date) (time)		Aesthetic and Minimalist Design	The receipt consists mostly of coded language; it's not clear that the stub is meant to be torn off and retained.	The lack of readability of the information on the receipt may lead users to assume there's nothing they need to read on there, so they would miss the indication that they should keep the stub "as proof of payment."	Major
10. Put on receipt on dashboard on curbside. *Screen:* WELCOME (date) (time)		Recognition rather than Recall	The receipt itself does not indicate that it should go on the curbside.	After users have walked away from the kiosk, they should not be expected to remember from the printed instructions on the kiosk that the receipt should go on the curbside. This should be reiterated on the receipt.	Moderate

As seen in the table, the most frequently fulfilled heuristic was "Visibility of System Status," with four fulfillments noted. The most frequently violated heuristic was "Consistency and Standards" with four violations, followed by "Help and Documentation" with three violations.

Two of the heuristics we had identified as especially relevant to this system, "User Control and Freedom" and "Error Prevention" are not mentioned in the table above. (The other heuristic that we considered highly relevant, "Match Between System and the Real World," was violated once, as noted in the table.) This is because the primary mechanism that allows users to "undo" a previous action or avoid an error is the "Cancel" button. This button is available at all points during the transaction until the payment is processed, but it is not used in a correctly performed task, so it is not included in the task description in the table. The presence of the button allows the system to fulfill these heuristics to an extent as the button prevents most significant errors, but not in a way that allows users to simply go back. For example, if a user pressed the "$1.00" button three times when he or she meant to press it only twice, he or she would have to cancel the transaction and start over, rather than simply "undoing" the accidental third press.

In addition, while somewhat fulfilling those two heuristics, the "Cancel" button actually violates another: "Help and Documentation." The written instructions next to the button say "Coin & Card Only." Since coins and credit cards are the only two forms of payment, it's not clear what's meant to be excluded (i.e. what form of payment can't they cancel?). Although documentation is provided, it is apparently meaningless.

Recommendations

As noted, the most frequently fulfilled heuristic was "Visibility of System Status," and this is due primarily to the on-screen instructions changing in response to the user's actions. We believe that further utilizing the screen would help avoid the frequent violations of the "Help and Documentation" heuristic. By adding more instructions to the screen and consolidating the written instructions on the machine, the user would be more easily guided through the payment process. This also would assist users who require translation, as the provided translation button only translates the screen instructions, not those written on the kiosk.

Consolidating the instructions would also help prevent violations of "Consistency and Standards," as there would no longer be multiple places where similar information is displayed. We particularly recommend clarifying which credit cards are accepted by displaying all four logos whenever a credit card logo is displayed.

We also recommend addressing two consistency issues with the value buttons. The first is that the value buttons are not labeled "value buttons" on the kiosk, but that is how they are referred to in the on-screen instructions. The second is that the buttons mix time ("MAX") and money ("$1.00" and "25¢"), and it may not be immediately clear to users that these buttons are all for the same purpose of choosing how much to charge to their card. One suggestion to resolve both these issues is to change the "$1.00" and "25¢" buttons to "1 HOUR" and "15 MIN" buttons and label them on the kiosk and on screen as "time buttons." Having the value buttons be factors of time rather than money makes sense because the user likely already knows how long he or she needs to park, but it requires mental computation to determine how much it will cost to do so. While this would prevent users from paying for less than 15 minutes of parking using a credit card, they would still be able to do so using coins. In addition, most kiosks are either $1.25 or $2.50 per hour of parking, so 15 minutes would only cost 31¢ or 62¢, not that much more than the current minimum payment of 25¢.

It's also necessary to address the major violation concerning the tear-off stub. While a useful feature, it is in no way obvious to the users that there's something to tear off. The on-screen instructions should note to tear off the stub, and the receipt itself should be redesigned to highlight that the stub is removable and contains useful information. The receipt should also contain instructions reminding the user to place it on the curbside.

Research Conducted
Cognitive Walkthrough

Executive Summary
We conducted a cognitive walkthrough, a research method that focuses on the learnability of a system. It is often used for walk-up systems,[9] such as a parking kiosk, that are used by first-time users and cannot involve an extended learning curve. Users must learn by doing, and quickly—or risk the frustration of others waiting behind them. Therefore, this evaluation provides critical information for an essential aspect of the usability of the parking kiosk system. The walkthrough found that eight of the ten action sequences involved in paying for parking are likely be to successful, while two are not. The failures concern the printed instructions on the kiosk and the tear-off stub on the receipt. We recommend moving as much of the instructions as possible onto the screen, redesigning the receipt, and improving other labeling on the kiosk.

Methods
The first step to performing a cognitive walkthrough is to identify the users. The users for the Chicago parking kiosk system consist of anyone who wishes to legally park at a metered parking space in Chicago, but for our testing purposes, we continued to focus on the novice user (identified as someone who has used the kiosk three or fewer times within the last year). The novice user is likely to be familiar with the general task of having to pay for parking, but will have limited or no prior knowledge of the kiosk interface.

The next step was to identify sample tasks and action sequences for evaluation. The sample task we chose was to park legally for two hours at a metered parking space with an hourly rate of $2.50, paying with a credit card. We adapted the action sequence for evaluation from the task description used for the heuristic evaluation.

We then performed the analysis. Ideally this evaluation would involve a group of analysts facilitated by an expert in cognitive science. In practice, however, we performed an initial walkthrough with the help of a graduate-level usability class. Additional refinement of the analysis was performed by a team member and then reviewed by the rest of the team.

9 Wilson, *UXR*, 357.

The output of a cognitive walkthrough is a list of the tasks and credible stories that indicate a user's probable success or failure with each task. To decide whether each task was likely to have a success or failure story, we used four questions as criteria:[10]

- Will the user try to achieve the right effect?
- Will the user notice that the correct action is available?
- Will the user associate the correct action with the effect they are trying to achieve?
- If the correct action is performed, will the user see that progress is being made toward solution of their task?

Results

The results are recorded in the following table.[11] As noted in the table, eight of the ten action sequences have success stories, while two do not.

Task: Park legally for two hours at a metered parking space with an hourly rate of $2.50, paying with a credit card.

Interface: A recreation of a typical kiosk interface is available in Appendix F.

Action Sequence	Success or Failure Story	Defense of Credibility
1. Read printed instructions on kiosk. *Screen:* WELCOME (date) (time)	Failure story: User will skip reading the instructions and begin by attempting to insert payment.	The cognitive walkthrough is based on the theory that people tend not to read instructions and prefer to learn by exploration.[12] In addition, the printed instructions are located in three different areas of the kiosk, causing confusion as to which ones to read, and increasing the possibility that the most relevant instructions may be overlooked. Reading the printed instructions is also limited to those users who can read English, since the provided translation button only translate the screen instructions; however, for the remainder of the walkthrough, we will assume the user can read English.
2. Lift flap that covers credit card reader. *Screen:* WELCOME (date) (time)	Success story: User will see that a flap covers the card reader and will lift it in preparation for inserting his/her card.	Users know they need to pay for parking, and since they're planning to use a credit card, they will look for a place to insert it. One's card cannot be inserted without lifting the flap, and if the user attempts to insert it without lifting the flap, he or she will quickly realize the necessity of lifting the flap.
3. Insert and remove credit/debit card. *Screen (once card is swiped):* VERIFYING CARD	Success story: Having removed the obstacle of the flap, user will dip his/her card in the reader.	Most credit card users will have experience with inserting a credit card into a machine. A diagram illustrates the action of inserting a credit card, and next to the reader are instructions to "insert credit card and remove quickly." A threat to the credibility of this story is that although users may insert the card, they might not do it correctly. They might insert the card the wrong way, as the diagram doesn't show how to insert it, and machines that accept credit cards vary in where they read the magnetic stripe. Still, if a user inserts the card incorrectly, it's easy for them to remove it and try again. If they read the screen, they will know they have done it correctly when the screen changes to "VERIFYING CARD."

10 Wharton, Rieman, Lewis, and Polson, "Cognitive Walkthrough", 12.
11 The format of this table is derived Wharton, Rieman, Lewis, and Polson, "Cognitive Walkthrough", 11-12, 17-21.
12 Wilson, *UXR*, 357.

Action Sequence	Success or Failure Story	Defense of Credibility
4. Read on-screen instructions. *Screen:* PAY WITH VALUE BUTTONS	Success story: Users will notice the screen change and read what it says.	Users have experience following on-screen instructions in other settings (e.g. banking ATMs, computers).
5. Press $1.00 button five times. *Screen (once a button is pressed):* PAID hh:mm EXPIRES $x.xx xx:xx xx:xxa/pm	Success story: User knows the cost per hour is $2.50, so he or she will calculate that he or she must pay $5.00 to park for two hours. He or she will see the $1.00 button and press it five times, watching the screen and stopping when $5.00 is indicated under "PAID" and "02:00" is indicated under "hh:mm."	Having seen the screen instruct them to "pay with value buttons," users will know to look for buttons to use for payment. Although there are no buttons labeled "value buttons," there are only three buttons located near the credit card swipe: "MAX", "$1.00", and "25¢". We assume users have the basic math skills necessary to calculate that they need to pay $5.00 to park for two hours. The buttons have a tactile response, so when they begin pressing them, they will know they have pressed them. They will also see the screen change and know they are successfully adding time to the meter. While ultimately a success story, this story has several threats that should be noted: • The large "3 hour parking" sticker at the top may lead some users to think that by paying with a credit card, their card will automatically be charged for three hours, or that they have to pay for three hours of parking, whether or not they want to park for that long. • We are assuming users have sufficient math skills to calculate the amount of money to enter to obtain a certain amount of time. If the buttons were labeled by time (e.g. "Add hour" and "Add 15 minutes") rather than money, no such calculation would be required. • The "value buttons" are not labeled consistently with the on-screen instructions.

Action Sequence	Success or Failure Story	Defense of Credibility
6. Press "Print receipt" button. *Screen:* PAID hh:mm EXPIRES $x.xx xx:xx xx:xxa/pm	Success story: When finished adding time to the meter, the user will locate the large green "Print receipt" button and press it.	Prior experience with other parking systems and other systems that take credit cards will make users expect an artifact to prove that they have paid. The instructions indicate that they need to press a green button to print a receipt, and while there are other green circles on the interface, there is only one green button, so users will locate it and press it. The button has a tactile response, so they will know they have pushed it. A potential threat to the credibility of this story is that the screen does not change to indicate that it's time to print a receipt, and users may expect it to print automatically. However, if time passes and the system does nothing after users have finished adding time, they will search the interface for what to do next, and the "Print receipt" button's prominence will lead users to notice that it's available.
7. Wait for receipt to print. *Screen:* PLS WAIT FOR RECEIPT TO DISPLAY ON DASH *Then:* CONTACTING BANK FOR AUTHORIZATION *Then:* PLS WAIT FOR RECEIPT TO DISPLAY ON DASH	Success story: After the user presses the "Print receipt" button, the screen indicates to wait for it to print, so he or she will do so.	The screen instructs users to wait, so they will. If they are confused when the screen changes to "CONTACTING BANK FOR AUTHORIZATION", they will likely wait as they decide what to do next, so the same effect will be achieved.
8. Take receipt. *Screen:* TAKE RECEIPT DISPLAY ON DASH	Success story: User will see and hear the receipt pop out, and he or she will take it.	Audio and visible cues inform the user the receipt is ready to take. The screen also changes to instruct the user to take the receipt. Users frequently take receipts in other contexts (e.g. pay-at-the-pump machines, ATMs), so they will know to pull on it and will recognize when they are holding it in their hand that they have successfully taken it. One potential threat is that so little of the receipt comes out that users might not see it, but if they saw the screen change, they would likely explore the part of the kiosk labeled "Take receipt" and quickly find it.
9. Tear off stub from receipt. *Screen:* WELCOME (date) (time)	Failure story: User will not notice that there is a stub that should be torn off, and he or she will not do so.	Tearing off the stub is not mentioned in the on-screen or printed instructions on the kiosk. The receipt doesn't seem to be designed to be readable by the user; it's mostly coded information in small text, so users are unlikely to study it. Their experience with other parking systems might suggest that the only receipt they get is what they put on the dash or take with them, not that there is something for them to put on the dash and take with them.

Action Sequence	Success or Failure Story	Defense of Credibility
10. Put on receipt on dashboard on curb-side. *Screen:* WELCOME (date) (time)	Success story: User will have read the printed instructions to place the receipt on the curbside of the dash, and he or she will do so.	The printed instructions on the kiosk direct the user to place the receipt on the dashboard on the curb-side, so as we are assuming successful completion of the prior tasks, the user will know what to do. It's also logical that the person checking for paid receipts will be walking along the curb, not in the street. However, neither the screen instructions nor the receipt itself indicate that the receipt should go on the curbside, so the possibility that users will place the receipt elsewhere on the dashboard is the strongest threat to the credibility of this story. There is also no immediate feedback for successful completion of this action. The only possible feed-back is negative—if users receive a ticket for placing the receipt in the wrong place, making it appear that they hadn't paid.

Recommendations

Overall, the kiosk interface fared well in this assessment, with only two failure stories noted. Still, some of the success stories have significant threats to their credibility that should be considered. We recommend that the highest priority be placed on addressing the two failure stories, and then considering how the threats to the credibility of the success stories can be eliminated or minimized.

The first failure story comes for the first action sequence: "Read printed instructions on the kiosk." As noted, the cognitive walkthrough is based on the theory that people tend not to read instructions, and even if they tried to do so, the diverse placement of the instructions is confusing. As recommended in the heuristic evaluation section, we suggest moving as much information as possible to the screen rather than relying on printed instructions. The on-screen instructions can't be as easily ignored as printed instructions, since the user would be looking to the screen to change to indicate progress. This would give users one place to look for information, and users have prior experience following on-screen instructions. Also, as mentioned, only the on-screen instructions are translated, so moving instructions onto the screen will assist users who require translation.

The second failure story comes in the eighth action sequence: "Tear off stub from receipt." As we did in the heuristic evaluation recommendations, we suggest that the receipt be redesigned to appear more readable and highlight that the stub can be removed. We also recommend that the instruction to tear off the stub be added to the on-screen instructions.

Finally, we believe the most urgent threats to the credibility of the success stories concern the third action sequence, "Insert and remove credit/debit card," and the fifth action sequence, "Press $1.00 button five times." Although users will likely eventually succeed with inserting their credit card, it would be helpful to add an indication to the diagram that shows where the magnetic stripe should be as they insert the card. Concerning the value buttons, numerous issues are noted in the table that could be overcome with improved labeling and on-screen instructions. A suggested solution for these issues is discussed in more detail in the heuristic evaluation recommendations section of this report.

Conclusion

Future Work and Final Thoughts
In our project plan we discussed two usability inspection methods that we would not conduct due to time constraints: a competitive analysis and A/B testing. In the plan we provided an outline of our reasons why we wanted to conduct those two additional tests and we discussed how we would pursue running these two additional tests. Future work on the Chicago parking kiosks could include running these two tests and comparing the results with what we learned from the usability inspection methods we did conduct.

We believe acting on our recommendations for improving the usability of the Chicago parking kiosks would lead to machines that are better designed and easier to use. Although we never received a response from LAZ Parking regarding the company's interest in our project we believe it was a worthwhile pursuit. Conducting the usability tests and writing this report helped all of us learn how to apply the principles of usable design to a real world system.

Bibliography

Kuniavsky, Mike. "Universal Tools: Recruiting and Interviewing," in *Observing the User Experience: A Practitioner's Guide to User Research*. Morgan Kaufmann Publishers, 2003. Accessed via Books24x7, http://common.books24x7.com.ezproxy.gl.iit.edu/book/id_7061/book.asp.

Nielsen, Jakob. *Usability Engineering*. San Francisco: Morgan Kaufmann, 1993.

Nielsen, Jakob, and Rolf Molich. "Heuristic Evaluation of User Interfaces," in *Proceedings of the ACM CHI 90 Human Factors in Computing Systems Conference 1990*, 249–56. Edited by Jane Carrasco and John Whiteside. Seattle: ACM Press, 1990.

Rubin, Jeff, and Dana Chisnell. "Debrief the Participant and Observers," in *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests*. 2nd edition. John Wiley & Sons, 2008. Accessed via Books24x7, http://common.books24x7.com.ezproxy.gl.iit.edu/book/id_25203/book.asp.

Scollan, Becca, Abby Byrnes, Malia Nagle, Paul Coyle, Cynthia York, and Maleka Ingram. "Drupal Usability Research Report," University of Baltimore, May 2008.

Wilson, Chauncey, ed. *User Experience Re-Mastered*. Burlington, MA: Morgan Kaufmann, 2010.

Appendix A
Survey Questions and Rationale

1. Have you ever used the current Chicago parking kiosks?

Answer type: Multiple choice

Answer options: Yes, No, Not Sure

Rationale: Establish whether or not the participant has used the Chicago parking kiosks so that they will be asked only the questions that apply to them.

2. How often have the following issues occurred when you used the Chicago parking kiosks?

Answer type: Likert scale

Answer options: Never, Rarely, Sometimes, Always

Issues: Didn't receive, a receipt when expected, Didn't remember how to use the system, Had difficulty reading instructions, Maximum meter time was too short, Kiosk was out of order, Didn't know if you had to pay for parking, Didn't know where to pay for parking, Had to walk farther than desired to get to the kiosk, Received a parking ticket because you made an error when using the kiosk, Your payment wasn't accepted

Rationale: This question identifies the currently known usability issues with the kiosks, as assessed by our team. Its goal is to identify how often users have experienced these issues. The issues that receive the most "Always" and "Sometimes" answers will become priorities during the redesign process, while answers that receive mostly "Rarely" or "Never" will become lower priorities.

3. Which of the above issues has been the most problematic to you?

Answer type: Multiple choice

Answer options: Yes, No

Issues: Didn't receive, a receipt when expected, Didn't remember how to use the system, Had difficulty reading instructions, Maximum meter time was too short, Kiosk was out of order, Didn't know if you had to pay for parking, Didn't know where to pay for parking, Had to walk farther than desired to get to the kiosk, Received a parking ticket because you made an error when using the kiosk, Your payment wasn't accepted

Rationale: This question gives participants an opportunity to express which issue presented in question #2 is the most problematic for them. It will provide us with a definitive list of which problems are the most troublesome for users and therefore the most essential to be addressed during redesign.

4. Why has this been the most problematic?

Answer type: Free response

Rationale: This question allows participants to express their opinions on the biggest problem they identified in as much depth as they see fit. It will provide direct quotes from users that can be relayed to stakeholders to back up why we chose to focus on particular issues during redesign. The responses may also provide ideas for how to eliminate those issues.

5. Which payment method do you prefer to use at the Chicago parking kiosks?

Answer type: Multiple choice

Answer options: Coins, Credit card, It depends

Rationale: Identifies users' preferred methods of payment. There are benefits to using both payment options, and we want to identify which payment methods are usually preferred in order to identify which methods should be enhanced or improved upon.

6. What makes you choose coins as your preferred method of payment?

Answer type: Multiple choice

Answer options: Convenience, I'm wary of sharing credit card information, I dislike using a credit card, I usually don't have my credit card when I park, Other (free response)

Rationale: Identifies users' preferred methods of payment. There are benefits to using both payment options, and we want to identify which payment methods are usually preferred in order to identify which methods should be enhanced or improved upon.

7. What makes you choose credit cards as your preferred method of payment?

Answer type: Multiple choice

Answer options: Convenience, I'm wary of sharing credit card information, I dislike using a credit card, I usually don't have my credit card when I park, Other (free response)

Rationale: Identifies users' preferred methods of payment. There are benefits to using both payment options, and we want to identify which payment methods are usually preferred in order to identify which methods should be enhanced or improved upon.

8. How satisfied are you with the time it takes to pay for parking using the Chicago parking kiosks?

Answer type: Likert

Answer options: 1 (Least satisfied), 2, 3, 4, 5, 6 (Most satisfied)

Rationale: Our team suspects that the amount of time it takes to pay for parking will be one of the biggest usability issues with the current design. This question will prove or disprove our assumption, and show us to what degree users find this to be a problem. We will cross-reference this question with the answers to question #5 to see how many credit card users are not satisfied with the amount of time it takes to pay for parking, as we have experienced that the time it takes for credit card approval can be longer than expected. A six-point scale was chosen to force the participant to express a level of satisfaction or dissatisfaction, without the option of neutrality.

9. Have you ever decided not to go somewhere because you would have to use the Chicago parking kiosks?

Answer type: Multiple choice

Answer options: Yes, no, not sure

Rationale: Identify extreme dissatisfaction with the system. Our team wants to know whether frustration with the current design leads users to abandon the system entirely. Several "Yes" answers would show that current design flaws lead users to abandon the system all together, which would have a significant effect on Chicago businesses.

10. On average, how often do you park at sports requiring you to use a Chicago parking kiosk?

Answer type: Multiple choice

Answer options: Less than once a week, Once a week, Two to four times a week, Five or more times a week

Rationale: Establish level of experience in using the system and see whether novice and expert users show differences in their opinions on what features are problematic. Much of our other research will focus on identifying the issues of novice users, since we believe making the system easily learnable for novices is crucial for a walkup system.

11. How often do you use other self-service systems besides the Chicago parking kiosks?

Answer type: Likert

Answer options: Never, Rarely, Sometimes, Frequently

Self-service systems: Automatic payment machines at parking garages, Automatic payment machines for public transit, Banking ATMs, Self check-in at airports, Self check-out kiosks at grocery/retail stores

Rationale: If someone wants to park on a street that has a parking kiosk, they have no choice but to use the kiosk. However, people often have choices as to whether they wish to use an automated kiosk or another method when using other services. For example, someone wishing to get money out of their bank account can use an ATM or go to a teller. The answers to this question will allow us to see whether users prefer to use automated machines or other options. We want to see if people who prefer to use automated machines report the same usability issues as those who prefer not to use them.

12. How easy do you find the following self-service systems to use?

Answer type: Likert

Answer options: Very difficult to use, Somewhat difficult to use, Somewhat easy to use, Very easy to use, Don't use/not sure

Self-service systems: Automatic payment machines at parking garages, Automatic payment machines for public transit, Banking ATMs, Self check-in at airports, Self check-out kiosks at grocery/retail stores, the current Chicago parking kiosks, The old Chicago meter system

Rationale: Based on the premise identified in the justification of question #10, we want to look at whether there is a correlation between people's perceptions of the ease of use of the parking kiosks and their perceptions of other automated systems.

13. Which of these systems do you find to be the easiest to use?

Answer type: Multiple choice

Answer options: Automatic payment machines at parking garages, Automatic payment machines for public transit, Banking ATMs, Self check-in at airports, Self check-out kiosks at grocery/retail stores

Rationale: Our team hopes to identify which systems are found to be the easiest to use so that we can learn from and possibly use components of those systems in our redesign.

14. What about the system you named above made you choose it as the easiest to use?

Answer type: Free response

Rationale: This question gives participants an opportunity to express what they like about the system they chose. It will help us generate ideas for redesign and will provide direct quotes to use in justification to stakeholders.

15. Which of these systems of you find to be the most difficult to use?

Answer type: Multiple choice

Answer options: Automatic payment machines at parking garages, Automatic payment machines for public transit, Banking ATMs, Self check-in at airports, Self check-out kiosks at grocery/retail stores

Rationale: Our team hopes to identify which systems are found to be the most difficult to use so that we can avoid using the components of these systems in our redesign.

16. What about the system you named above made you choose it as the most difficult to use?

Answer type: Free response

Rationale: This question gives participants an opportunity to express exactly what they do not like about the system they chose. It will help us identify features to either fix or avoid during redesign. It will also provide direct quotes to use in justification to stakeholders.

17. How old are you?

Answer type: Multiple choice

Answer options: 18 or younger, 19-29, 30-39, 40-49, 50-59, 60 or older, Prefer not to say

Rationale: Enable cross-tabulation for age to see if there is any correlation between age and perceived usability of the parking kiosk. Identifying a particular age group that has difficulty with certain aspects of the design will help identify which areas we need to focus on during redesign to improve accessibility.

18. Where do you live?

Answer type: Multiple choice

Answer options: In the city of Chicago, Suburb of Chicago, Other

Rationale: Enable cross-tabulation for residency to see if there is any correlation between residency and perceived usability of the parking kiosks. If there is a correlation, further research may need to be done to determine how to make the system equally easy to use for residents, suburbanites, and visitors.

19. Your name?

Answer type: Free response

Rationale: Required for participants to win the amazon.com gift card

20. Your email address?

Answer type: Free response

Rationale: Required for participants to win the amazon.com gift card. This data will also allow us to contact participants for any necessary follow up.

21. Please share any other comments you have about the Chicago parking system.

Answer type: Free response

Rationale: Allows participants to share any additional opinions regarding the kiosks. This may help identify other usability issues that were not identified by our team. It will also provide direct quotes we can present to stakeholders.

22. Please share any comments you have about this survey.

Answer type: Free response

Rationale: Will provide feedback to our team on participants' perceptions of our survey instrument for further improvement of our team's usability testing skills.

Appendix B
Observation Checklist

Total Time:

Insert Payment
a) coins
b) credit card

1. Choose Time
2. Press Print Receipt Button
3. Wait for Receipt to Print
4. Take Receipt
5. Tear Off Stub
6. Put on Dashboard on Curbside
7. Reads Screen Prompts
8. Reads Top Instructions
9. Reads Bottom Instructions

Behaviors Noticed
a) Squinting
b) Sighing
c) Finger wandering
d) Swearing
e) Furrowed brows
f) Questioning gestures
g) Audible noises
h) Long pauses

Barriers to Completion
a) Didn't hit print receipt
b) Forgot to lift the flap
c) Didn't purchase enough time/problem with conversion time-money
d) Not removing credit card
e) Put in Credit card wrong way
f) Didn't take receipt
g) Putting receipt in wrong place/not putting receipt in car

Appendix C
User Observation

User Number	1
Name	Kristen
Age	29
Residence	Chicago
Previous experience using the Chicago Parking Kiosk	Yes
Previous experience using self-service parking meters	Yes
Previous experience using self-service kiosks	Yes
Successful completion of the task	Yes
Noticeable sticking points	None
General comments	None

User Number	2
Name	Stephen
Age	67
Residence	Chicago
Previous experience using the Chicago Parking Kiosk	Yes
Previous experience using self-service parking meters	Yes
Previous experience using self-service kiosks	Yes
Successful completion of the task	Yes
Noticeable sticking points	None
General comments	Some finger wandering noticed

User Number	3
Name	Dave
Age	
Residence	Chicago
Previous experience using the Chicago Parking Kiosk	Yes
Previous experience using self-service parking meters	Yes
Previous experience using self-service kiosks	Yes
Successful completion of the task	Yes
Noticeable sticking points	None
General comments	User was unsure if he did something wrong while waiting for receipt; said "where is it?" (referring to the receipt) and seemed frustrated. User pointed to the kiosk directions when performing the task. Behaviors noticed: finger wandering around the kiosk interface, squinting at the screen, "frustrated" behaviors (sighing, raising hands in frustration/ questioning gesture).

User Number	4
Name	Dan
Age	27
Residence	Chicago
Previous experience using the Chicago Parking Kiosk	No
Previous experience using self-service parking meters	No
Previous experience using self-service kiosks	Yes
Successful completion of the task	Yes
Noticeable sticking points	Did not initially lift up the plastic flap that covered the credit card reader; had trouble figuring out how much value to add to the meter
General comments	Dan started by looking closely at the top of the kiosk, then looked down at the bottom. He took longer than expected to figure out how to begin the process (32 seconds). He squinted while reading the directions. When the receipt printed, he reached for the receipt but pulled his his hand away and waited another few seconds before ultimately taking the ticket. He waited another second or two and then took the receipt. He examined the receipt closely for a full 13 seconds before walking away from the kiosk.

User Number	5
Name	Matt
Age	29
Residence	Chicago
Previous experience using the Chicago Parking Kiosk	No
Previous experience using self-service parking meters	No
Previous experience using self-service kiosks	Yes
Successful completion of the task	Yes
Noticeable sticking points	None
General comments	Matt approached the kiosk and immediately inserted the credit card into the card reader. He suggested the addition of a Purell dispenser on the side of the kiosk. After some brief "finger wandering," he pressed the "$1.00" and "$0.25" buttons. He knew exactly which buttons to push. He then leaned back, crossed his arms and waited for the receipt to print.

User Number	6
Name	Peter
Age	32
Residence	Chicago
Previous experience using the Chicago Parking Kiosk	Yes
Previous experience using self-service parking meters	Yes
Previous experience using self-service kiosks	Yes
Successful completion of the task	Yes
Noticeable sticking points	None
General comments	Peter approached the kiosk and immediately identified the credit card reader. He lifted the flap, inserted and then removed the credit card. He said to the observer, "How would you do this with coins? I don't even know." Peter pressed the "$0.25" button once, watched for the screen to change and then kept hitting the "$0.25" button until the screen told him he had over an hour's worth of parking. He waited patiently as the receipt printed. He then took the receipt and placed it in the car without taking the perforated portion of it off.

User Number	7
Name	Stephanie
Age	29
Residence	Suburbs of Chicago
Previous experience using the Chicago Parking Kiosk	No
Previous experience using self-service parking meters	Yes
Previous experience using self-service kiosks	Yes
Successful completion of the task	Yes
Noticeable sticking points	Originally planned to pay with a dollar bill before realizing bills weren't accepted. She first read the set of instructions with the exclamation mark and was frustrated that they didn't tell her how to use the machine. She looked for the green button to print the receipt, but the plastic cap over the button made it difficult to see the color unless she was looking at it straight on, which required leaning down.
General comments	Although she expressed some frustrations, she successfully completed the task and commented that it "wasn't as bad as I thought it would be." She thought the receipt should be called something else, like "ticket" or "pass." She appreciated the option of paying with credit card.

User Number	8
Name	Matthew
Age	25
Residence	Toledo, Ohio
Previous experience using the Chicago Parking Kiosk	Yes
Previous experience using self-service parking meters	None
Previous experience using self-service kiosks	Yes
Successful completion of the task	No. Thought he was done after putting in the credit card, and pressing the $1.00 button
Noticeable sticking points	Didn't know if he needed a receipt. Didn't know what to do with the receipt.
General comments	General finger wandering. Swearing at himself Swearing at machine. Within the first 5 seconds, he stated "I'm reading, because I don't know what to do....the credit card thing is somewhat obvious." Matt immediately put the credit card in, and said, "it says the credit card is verifying." After put the card in, he calculated how much time cost, and hit the value buttons. After he hit the value buttons, he said, "OK, I assume I'm done now, but I have no idea...I don't really want a receipt so...I'm done now." I later informed Matt that he needed the receipt, and he said he didn't know that. Once he printed the receipt, he didn't know what to do with it. Matt wished that there was more of a step-by-step hierarchy to the process. He said all the elements were just randomly placed.

User Number	9
Name	Jackie
Age	27
Residence	Chicago
Previous experience using the Chicago Parking Kiosk	Yes
Previous experience using self-service parking meters	None
Previous experience using self-service kiosks	Yes
Successful completion of the task	No. Put the credit card in, took too long to hit the value buttons, and thought that's all she needed to do.
Noticeable sticking points	Didn't know if she needed a receipt. Didn't know what to do with the receipt.
General comments	General finger wandering. She approached the kiosk, didn't read the instructions, and put the credit card in the slot. She waiting about 10 seconds, said that "the card is being verified," and then waited. She then read the instructions, and tried figuring out how much it cost. She hit the max button, and waited about 10 seconds before saying, "I don't know what to do." She quit after this.

User Number	10
Name	Jaime
Age	32
Residence	Milwaukee
Previous experience using the Chicago Parking Kiosk	Yes
Previous experience using self-service parking meters	None
Previous experience using self-service kiosks	Yes
Successful completion of the task	No. Put the credit card in and hit the receipt button multiple times. The process was cancelled.
Noticeable sticking points	Didn't know if she needed a receipt. Didn't know what do to with the receipt. Didn't know how the kiosk knew how much money she wanted on the card. Took a long time converting the cost to time.
General comments	General finger wandering, Swearing at machine. She immediately placed the credit card in the kiosk, without reading any of the instructions. She waited for about 10 seconds and said "How does it know what I want?" She then hit the print receipt button. After realizing this did nothing, she hit the Max button. While she was doing this, she was mumbling about what buttons cost what amount, and how much time it gave her. She hit the Max button 2 more times, and was shocked that nothing was happening. At this time, she gave up, because she didn't know what else to do. After I asked how much the Max button was worth, she said "A dollar, because that's what the instructions said."

User Number	11
Name	Eva
Age	29
Residence	Chicago
Previous experience using the Chicago Parking Kiosk	Yes
Previous experience using self-service parking meters	None
Previous experience using self-service kiosks	Yes
Successful completion of the task	Yes
Noticeable sticking points	Didn't know if she needed a receipt. Didn't know what do to with the receipt. Took a long time converting the cost to time.
General comments	Eva approached the kiosk and immediately said, "I see 2 hour parking." She almost took 30 seconds calculating the time/cost in her head. After this, she put the credit card in backwards. She recognized this, and flipped it around, but let it sit in the machine. She said, "it's verifying the card..." She hit the $1 value button, because she didn't know she could pay in quarter increments. She didn't know what to do after she hit the value buttons. She waited 20 seconds after not knowing what to do, and then hit the print receipt button. She waited another 20 seconds, not knowing if what she did worked, until the receipt finally came out. Eva was confused by the placement of the graphics on the How To sticker. Because of this, she was confused about how much to pay, and how much each value got her in time. She, too, wished the the written instructions were at the top of the machine, and the elements were placed in a step-by-step hierarchy.

Appendix D
User Interviews

User Number	Pre-Task Interview	Port-Task Interview
1	*Warm-up* Kristen drives a 2008 Honda Fit. She parks at a kiosk roughly twice a month. She's been parking in Chicago for five years. *General Impressions of kiosks* "It's convenient to not carry around change… some parts of the city are really expensive [to park at a kiosk], like $4-6/hour." She doesn't like that meters are no longer free on Sundays or holidays. *Impression of old parking meters* "I like that they were cheap…kind of a hassle when you don't have change." Kristen expects to pay with a credit card when parking and she's used to parking and walking to a kiosk. *General experience using kiosks* "Machines take awhile to process credit cards…it's expensive…bad for business [because parking is more expensive]."	*Experience of paying for parking* "It's convenient cause I didn't have any quarters with me but expensive. Used to be 25 cents/hour, now it's $1.25/hour." *Impression of the interface* "It was fine, had directions on the front. Not difficult for me cause I've parked at kiosks several times and I know how the interface works." *Would you add anything?* No *Were you frustrated or confused?* "No, but the first time I used a kiosk my credit card got stuck and I found the interface very confusing." *Was anything especially intuitive or helpful?* Kristen likes that you can use a credit card. She likes colors for buttons and thinks it's pretty self-explanatory.

User Number	Pre-Task Interview	Port-Task Interview
2	*Interview* User drives a 2009 Toyota Camry. User parks at a kiosk once every two weeks or so. He has been driving and parking in Chicago for forty years. *General Impression of kiosks* They're easy to use, convenient. Likes option of coin and credit, has used both. *Impression of old parking meters* Okay, though occasionally they would jam. Occasionally inoperable. Steve expects to pay with coins, expects to park at a kiosk. *Experience using kiosks* Positive experiences, no problems, worked well, overall a positive improvement over meters.	*I noticed your finger was wandering around the interface during the observation: what were you doing?* "I was reading instructions on the [display] screen, looking for the appropriate place to place coins." *Experience of paying for parking* "Noneventful, easy to do. Concerned about getting time right [just the right amount of time to run an errand]." *Impression of the kiosk interface* "Okay, [display screen] could have been brighter. It's just black on grey." *Would you add anything?* "No, I think it's fine, pretty well designed." *Anything frustrating or confusing?* No *Anything helpful?* "[Display screen] instructions were clear, coin slot clearly marked." Steve added that he thinks the maximum time allowed is too short; the kiosk should allow more time for running errands. Also, if he only has a 10-15 minute errand he'll just park his car without paying for parking and run the risk of getting a ticket.

User Number	Pre-Task Interview	Port-Task Interview
3	*Warm-up* Dave drives a 2003 Honda Civic and parks roughly once a month at a kiosk. He uses garages for parking at home and at work. He has roughly seven years driving and parking experience in Chicago. *General Impressions* Dave says parking kiosks are "mostly good" and he doesn't mind that he has to "stop and figure it out each time...seems easier cause I don't have to have coins." Says he likes using debit card but adds that "the only bad feeling I have is that the city got screwed in the deal." Also mentions that he misses bike parking that came with the old parking meters. *Impressions of Old Parking Meter System* "It was bad, this way [kiosks] seems so much better. Feels like you're spending more money with quarters...I do worry a little about identity theft [because kiosks allow users to use credit cards]."	*Description of Experience of Using the Kiosk* "Fine," "quick," "no hassle." "Easier to park on the street than in a garage...can always find a space at a kiosk." *Thoughts on the Kiosk Interface* Dave thinks the instructions "could be clearer...it's not immediately clear what you need to do, like at an ATM." He doesn't want "to stop and remember and figure it out every time." Also adds that the kiosk should be taller, at eye level, but adds that that might be hard because users are all at different heights. *Anything to Make the Experience Easier?* Dave says the coin slot should be highlighted so you know where to put your coins. *Were You Ever Frustrated?* Says when he was waiting for the receipt he was frustrated; he thought he'd done something wrong. *What Do You Think of the Kiosk Interface?* "None of it's intuitive...it can be understood if you put effort into it." Wonders "where will receipt come out?" Says display is pretty easy to read, but adds that you "don't immediately know that's what you should be looking at." *Final Comments* "Easier than old-fashioned meter." "Seems like they could be easier to use overall."

User Number	Pre-Task Interview	Port-Task Interview
4	Dan does not own a car and drives very infrequently. He has never parked on a Chicago street or used a parking kiosk. He assumes the old meters were easier to use but sees the option of using debit cards as a big improvement. If he did have a car, he would probably use a debit card to pay for parking as he always has a debit card but only has change on him occasionally.	He thought the kiosk was "Pretty easy. Simple. Hassle free. Maybe a bit confusing at the beginning," In the beginning, the most confusing thing to him was the pricing. He was thrown by the fact that 48 minutes = $1.00. He wants buttons to say both how much time they gave and how much they cost. He saw $1.00 but his mind equated that to one hour. "Ok, I know how much money I'm using but how much time am I buying?" "The directions are easily viewed. Once I found them, I just needed to follow them." He thought the buttons were clearly marked and he recognized credit card slot. Dan noticed there wasn't a place to insert bills. "If I only had bills, I would sort of be up the creek, as it were." "It says max here. What does that mean, max time or max money? I guess they're the same but I had to think that through." "There was a moment where it said "take receipt" but then it looked like it was still printing so I wasn't sure when to take the receipt." "I liked the big buttons." Green and red buttons made sense to him color-wise. He was pleased with the different columns that showed how to use the coins vs. the credit cards (two arrows 2/3 of the way down the directions).

User Number	Pre-Task Interview	Port-Task Interview
5	Matt does not own a car. He has owned a car in the past but does not own one now. Has never parked at a parking meter and hasn't parked in the city since 2004. He has seen people squint when using the kiosk and has seen some lines form at the kiosks. He noted the inconvenience of having to walk to a kiosk since there is only one kiosk within a given distance. "You could park somewhere really far away from [the kiosk], and then you know you have to pay it but you don't know where it is, and you kinda have to walk in the opposite direction, which is, like, not really that much time, but its an inconvenience." Feels the city should have gotten a better deal form LAZ parking and that the meters should be owned by the city. He doesn't like that citizens' parking money is now funding a corporation instead of the city. He doesn't think a corporation would be as interested in providing a quality meter to help the citizens. He likes that people no longer need change because they can pay by credit card. He thinks credit cards are more convenient because no one carries coins.	General impression of kiosk: "It was relatively easy. It was fast. It was quick." Matt would prefer a side swiping credit card slot over the front loading reader the kiosks have now. He thought the max time was too short. He said the current screen looked "ancient." Matt really wants a color touch screen. He pointed out that the buttons will break eventually. Also, a touch screen would be more aesthetically pleasing. Matt wants up and down arrow buttons that would allow you to increase or decrease the time you're paying for. He would like both credit card and debit card options. He would like the kiosks to be more like the touch screens in the airport. "[The current screen] is just not friendly. You have to stare at it longer." In reference to the instructions on the bottom left: "I don't like this crazy box of words." He really liked the easily visible "1 HOUR = $1.25" part of the directions.

User Number	Pre-Task Interview	Port-Task Interview
6	Peter Drives a 2002 Honda Civic. He parks in a garage at home and at work. He used to park on the street quite a bit, but he rarely does anymore as he has parking at home and at work and typically doesn't drive his car to go other places in Chicago. Instead he typically rides his bike. Peter doesn't like the kiosks as much as he likes the old meters, but he appreciates the fact that he can pay with a credit card. He doesn't like that he can no longer leave minutes for another person once he has left his parking spot, nor can he use minutes left over by another person. "The act of refilling your parking if you're staying is more complex and time consuming. You often have to walk a long way to your car and then go and get into your locked car just to put the sticker in" He doesn't like that there is now less bike parking. He doesn't like walking far in the cold to pay for parking. Peter has encountered plastic flaps being frozen which blocked him from getting the receipt. Once he had to walk across the street to another meter to get a ticket when a flap was frozen.	Peter was able to recognize the card reader quickly because it looked just like a card reader at the gas pump. "Hours of operation, time limit and price. Those are the things I need to know upfront." Pete used the "$0.25" button as he did because it was raining so he was in a hurry to pay and get out of the rain. He didn't want to take time with the conversion rate, so he just used the smallest value button and kept hitting it until he had an hour. He would like to see the hours of operation, time limit and price right next to the screen. He felt the warning about being towed if you don't pay for parking was least useful and should not be at eye level. He found the value buttons to be very intuitive. He found the green of the print button and the red of the cancel button to be intuitive. He would like the text screen to be larger. Also he has to squat to read the screen, so he wishes it were angled up so he didn't have to bend down. He also remembers a few times when there was a glare on the screen, making it hard to read. He thinks the time limit and hours of operation should be lit up and more visible. He has heard about the iphone app that allows you to pay for or refill your parking through your phone and would be interested in that.

User Number	Pre-Task Interview	Port-Task Interview
7	*Warm-Up Notes* Stephanie drives a Ford Taurus. She parks in Chicago about once a year, usually at free street parking. She has been driving and parking in Chicago for about eight years. *General Issues Notes* Stephanie's general impressions of the Chicago parking kiosks is that they're "stupid", "outsourced", and "they don't work." She never had a problem with the old parking meters when she had to use them, which was only once or twice. "You just had to put coins in; it was easy." But, she said those required coins, and for the new kiosks, you don't need coins, which is nice. When she needs to pay for parking at garages, she pays with credit card and appreciates not having to carry around change or worry about having the correct amount or enough. She doesn't regularly park at any meters, and she doesn't think proximity to a parking kiosk would really affect where she would park. "Just want a spot close to where I was going" and "would be nice if it was obvious where I was supposed to pay."	*Retrospective* When asked to describe the experience, Stephanie said she was nervous because she was being timed. But she also said it was "OK" and it felt like she just had to read it and do it right. She didn't like that it didn't take bills, but she would normally use a credit card anyway. When asked about the kiosk interface, she said that she knew where the credit card and coin inputs were, but the buttons were harder. She again mentioned not being able to tell the print receipt button was green but that the "print receipt" label was helpful. When asked what could be moved, removed, or augmented, she initially said "nothing" but then mentioned that she felt tall for the machine, but she is tall. The directions were located too low. When asked about what frustrated her, she mentioned the green color button issue again and how it only took dollar coins: "Really? Who uses those?" She felt the flap over the credit card input was probably helpful and noted the presence of the language button. Overall, she stated that it "wasn't as bad" as she thought it would be. Paying with credit card is good, and before you couldn't do that, so the new kiosks aren't bad. It saves time for the meter maids too - seems more efficient because they wouldn't have to do any calculations. The big beef she thinks people have with the machines is when they malfunctions, but hers didn't do that, so she didn't have a problem. She also mentioned confusion that when she chose $1.25, it said 32 minutes, rather than 30 minutes, as she expected.

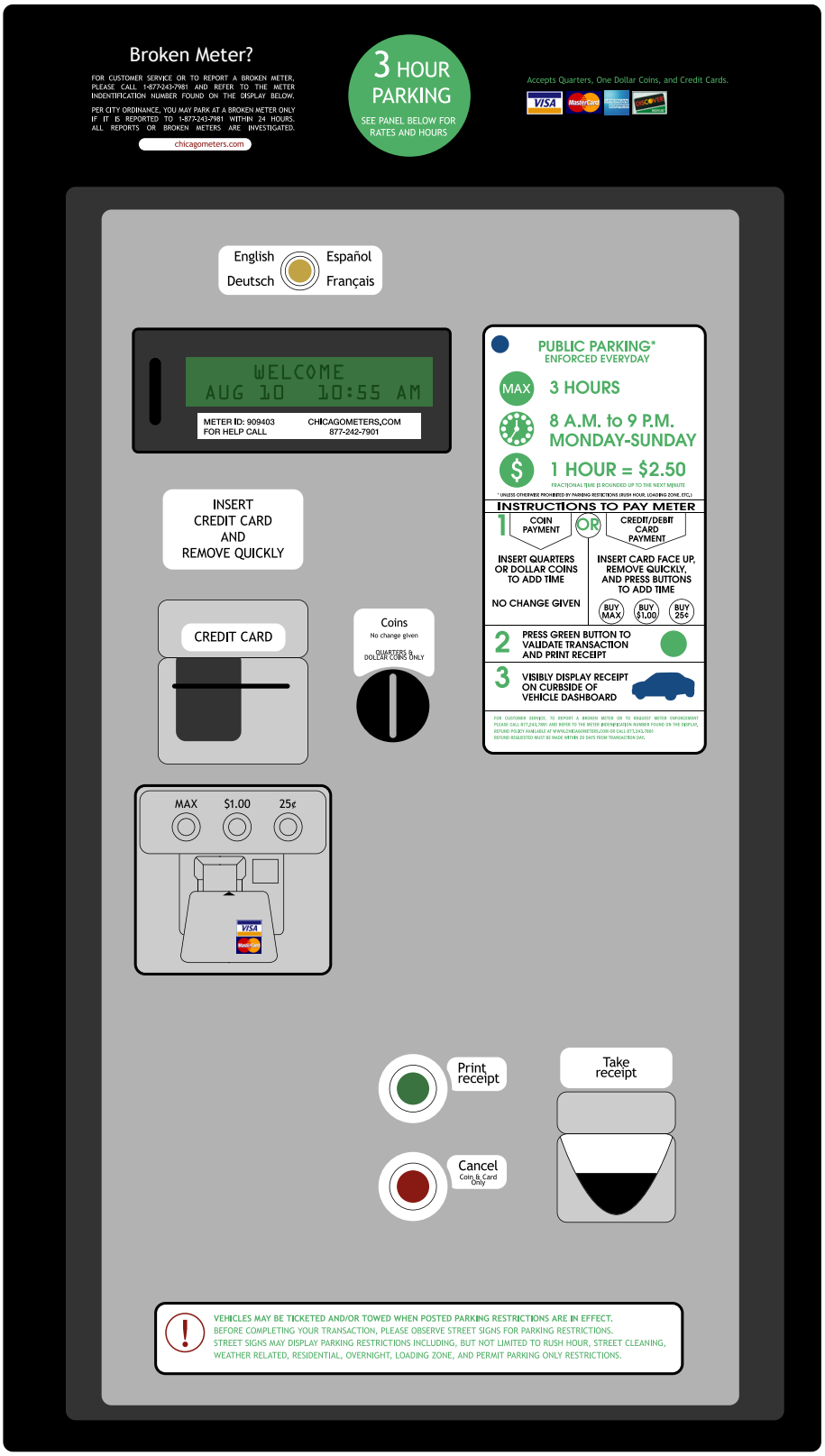
User Number	Pre-Task Interview	Port-Task Interview
8	Matt owns a car, and drives it daily. He typically parks in a parking lot at work, but uses a parking meter and/or kiosk from time-to-time. He has been to Chicago a few times, but has never driven in the city. He never used the Chicago Parking Kiosk before. He commented that there should be more kiosks. He was annoyed that we had to walk roughly 25 yards to use the meter. He said he was going to use a credit card, because he didn't have any change on him.	Matt said that the interface's elements were too spread out and didn't have a step-by-step hierarchy. Also, he didn't know that he needed a receipt, let alone what to do with it (after I told him he needed a receipt). Overall, he thought the parking kiosk was annoying to use, and thought an easy fix would be to place "Step 1, Step 2, Step 3..." headings around the elements that needed to be used, because the headings on the printed instructions were too small and an after-thought.

User Number	Pre-Task Interview	Port-Task Interview
9	Jackie owns a car, and drives it daily. She typically parks in a parking lot at work, but uses a parking meter and/or kiosk from time-to-time. She never used the Chicago Parking Kiosk before. She didn't comment on the distance parking kiosks are because she is familiar with seeing them around in the city.	Jackie thought that she was doing it right. When I asked her why she didn't read the instruction thoroughly, she said that she "didn't have time to read the instructions, because they looked like it would take too long." She wished the interface's elements would be condensed, and well as the instructions. She kept repeating that "no one has time to read all that stuff."

User Number	Pre-Task Interview	Port-Task Interview
10	Jamie owns a car, and drives it daily. She typically parks in a parking lot at work, but uses a parking meter and/or kiosk from time-to-time. She has been to Chicago a few times, but has never driven in the city. She never used the Chicago Parking Kiosk before. She didn't comment on the distance it took to walk to a kiosk.	Jamie's major concerns was trying to figure out was much time cost. She felt the written instructions, and how they were displayed, were confusing, and could have been displayed better. She believed that the $1.00 amount was a max amount, and couldn't figure out why there were "max" and "$1.00" buttons next to each other on the interface when they were valued the same. She also commented that the screen was hard to read because of the glare from the sun.

User Number	Pre-Task Interview	Port-Task Interview
11	Eva doesn't own a car, but has driven one. She never used the Chicago Parking Kiosk before. When approaching the kiosk, she immediately went to the curb-side part of the kiosk, because she believed that's the logical place it would be, because people would be walking from the street.	Eva successfully finished the task, but was uncomfortable during the whole process. She was unsure of herself, and was second-guessing her actions. She was self-aware, and thought that "something had to be done to make it a lot easier." Eva was confused by the placement of the graphics on the How To sticker. Because of this, she was confused about how much to pay, and how much each value got her in time. She wished the written instructions were at the top of the machine, and the elements were placed in a step-by-step hierarchy.

Appendix E
Participatory Design



Appendix F
Typical Kiosk Interface