Design Document

HCI II: Interaction Design

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Project Description

In the state of New York, the average commute to work is 30.4 minutes. That's about an hour a day of mostly wasted time. Even more relevant is the fact that between New York City and Baltimore, 5.6 percent of commuters spend 90 minutes or more getting to work.

The task of "making travel time productive" has been taken on many times before, but traditionally has fallen short. Team Yellow decided to focus on turning taxi cab commutes into usable time. Similar systems have already been implemented in a number of taxis, but all have been plagued with shortcomings and low usability.

Basic features of our system include:

- Choosing a destination and monitoring travel route with on screen map
- Reading News from many sources
- Viewing travel information such as weather and flight information
- Viewing local attractions / purchasing tickets for local attractions
- Paying for ride with credit card using our system

The features listed above have been carefully thought of. We wanted to make the system affordable and profitable for cab companies so the system would actually be purchased, yet useful enough that passengers would actually use the system. We believe the features chosen for our system strike the right balance.

In developing such a system to make travel time productive, we must first understand the constraints for the system we are developing. The first major limitation is the system must be small enough not to take up too much space in the a taxi. It must not interfere with the passengers and driver by being too large. A realistic assumption is that the device should fit on the back of a seat.

Another constraint is the device must be stable enough not to move around when the cab is moving. Therefore the device will have to be in a fixed position to avoid moving or breaking during the ride.
A third constraint is the device must be able to be used in low light conditions (such as at night). Therefore the screen must be very bright and easy to read.

Our current design based on these constraints would be to include two displays in the back of the cab (on back of the driver and passenger seats) and another display mounted in the front of the cab for the driver (who can also interact with the system).

Stakeholders

The stakeholders for our system are clearly recognizable. They are the taxi drivers, taxi company, tourists, and commuters. They are all critical to the success of the system and have very different needs.

Taxi Driver

Taxi drivers are usually middle age males from a variety of different cultural backgrounds (usually immigrants) trying to better their income. Taxi drivers speak a variety of different languages so the system will need to accommodate many different languages. Driver's educational background is actually quite good. A survey of NYC cab driver's reported that almost 60% of them have some college experience.

A main concern of Taxi drivers is the privacy of the system. Many of these systems have failed previously because drivers were tracked by their company and driver's thought that was an invasion of privacy. If the privacy of the system is not addressed, the system will not sell and never be used.

Expectations of the system are numerous. It MUST be as fast as the current system used in taxi's for determine the cost of the ride. If the system is slower even with its added benefits, it would frustrate the driver's greatly. The system also must be simple enough to use by the passenger so driver's are not constantly bombarded with questions from confused passengers. A final expectation of the system is that it must not cost the taxi driver anything to have the system installed in their cab and it would be preferable if the system could provide another source of income for the driver (as it would require some training to learn the system).

The required skills of the driver are very limited. They have to be able to interact with a simple to use touch screen display. They must also know the basics of how the system works from the passenger

perspective in case they are asked questions about the system. Since most driver's have a decent amount of education learning this system should not be too difficult.

Taxi Company Owner

A taxi company like any company has the goal of making a profit. In order to make a profit with rising fuel costs every penny counts. They want their cab driver's to be honest and report tips and distance traveled accurately. They are always looking for other sources of revenue (Besides starting a game show in their cab, Cash Cab TV show reference). A taxi company must be assured that a new system would at least pay for itself and help differentiate their taxi company from the competition. They don't want the system hard to install or require a lot of maintenance as that would increase costs. They just want the system to work and be as transparent as possible.

The required skills from the taxi company's perspective would be the ability to attract local businesses to advertise in their cabs. The taxi company would also need basic computer skills in order to add advertisements to their taxi fleet. From a taxi company's perspective the system would be as transparent as possible.

Tourist

A tourist is defined as someone who is visiting a location for pleasure. They most likely do not know the area well (unless they have been there a lot). A tourist could speak a variety of languages and have varying levels of sight, hearing, and computer abilities. With such a wide user group, we are aware that the system will not be able to be used by everyone, but it can be created in a way where it can be used by the most people possible.

Expectations for the system are that the system must be available in multiple languages and have a large font size for easy reading. The interface must be simple enough for someone with little or no computer experience. The system also must be useful or at the least not annoying to the passenger. The goal of the system is to make travel time productive, so anything the system has must encapsulate that vision.

Minimum requirements for the system are vision and the ability to use a touch screen display. It would be helpful for a user to have some computer experience but the goal of the system is to allow a 90 year old grandma that has never seen a computer use our system.

Commuter

While all customers of the cab are commuters this stakeholder group refers to the "regular" commuter. This is someone who takes the cab, often on a daily basis, as part of their routine. They often know the routes the cab travels, but either cannot or choose not to drive themselves. Their rides are sometimes very long and this time is often spent preparing for the day by either catching up on current events or working on their own tasks. Their most common usage of our system would be to read news and to speed the payment transaction. On rare occasions they might use it to book meal reservations or entertainment tickets when it is convenient.

Their requirements are the same as a tourist.

User Persona's

Dishonest Taxi Driver

Author: Chris Muench

Sekou Fofana a 42 year old male immigrant from Guinea (a West African country) is currently employed by Yellow Cab in New York City. Sekou speaks both French and English but prefers reading in French (as that is his native language). He has been working for Yellow Cab for the past 6 months to earn a better living, as he was previously a factory worker for GM. Sekou has never attended college, but did have some formal education in Guinea and has the ability to read English. Sekou is familiar with using computer systems as he was required to do so in his previous job at GM (on a pretty low level, but nerveless interacted with them). Sekou is considered a risk taker as he is not scared to change jobs or lifestyle.

Sekou enjoys being a cab driver in NYC. He finds the pay of his job better than he previous job and enjoys the challenge of driving in New York City and weaving in and out of traffic. He makes more money than other cab drivers because of his aggressive driving and he sometimes turns off the meter and charges customer's off the record of the cab company. Since he has never been caught, he figures

he never will. He knows his way around the city well, but often time's customers (mostly tourists) question his ability to get them to their destination. Overall Sekou is satisfied with his job, but if there was another way to make money he would be all for it.

Honest Taxi Driver

Author: Gregory Koberger

Like 59% percent of his colleagues, Ranjit Manesh did attend college. When his father got sick, though, he dropped out of college in order to keep the family's taxicab medallion. Currently 49, Ranjit had always planned on returning to his studies as soon as he can save up enough money- but that never happened. While English is his current primary language, he has a heavy accent that sometimes makes him hard to understand.

Ranjit works hard, but always plays by the rules. He doesn't approve of the deceitful tricks many of his coworkers use in order to make more money, which has resulted in him becoming somewhat of an outcast. His good service and positive attitude,h however, has earned im a number of loyal customers-

including a few wealthy, high tipping business men who specifically request Ranjit whenever they're in town.

Taxi Company Owner

Author: Phil Andrews

Bob Smith, the unmarried 55 year-old owner of Red Top LA Cab Company, is originally from Durham North Carolina. He has been the owner of his company for the past 10 years. Bob graduated with a BS in Business from University of Rochester and received his MBA from Harvard. He has a hard job of managing his expanding fleet of 300 cabs in LA and many employees. Bob has passing familiarity with computers, he recognizes they are now a necessary part of doing business but has no particular love for them. He generally gives up and tries again later when he has problems doing something. He is finding it harder and harder to make a profit due to rising fuel prices and the slowing economy. His employees have been mostly reliable but there has been an occasional employee who has tried to steal money from the company. Red Top is a national cab chain, but each franchise owner is allowed a great deal of freedom.

Bob is looking for something innovative to do with his brand to increase revenue and impress upper management to become a vice president of the Red Top company. Although he has been able to grow his company steadily the past 10 years, it has mostly been due to more people moving to LA than his skills as a owner. His main goal is to improve his company, which is to say his revenue. Bob was quite a bit more uptight when he started the company, but now is very casual except when he needs to step in and keep things moving the way he wants. Bob doesn't like things that are high-maintenance.

Commuter

Author: Matt Patrick

Thomas Shanahain is a 24-year-old who lives in Staten Island, and is Systems Analyst for a thriving web development company located in the financial district of Manhattan. He has a bachelor's degree in computer science from Alabama State University. Thomas's career is top priority in his life. He only has time on the weekends to socialize, and most of his relationships never last more than a few months. Tom is a very laid back easygoing guy, but tends to get frustrated easily if things do not go according to plan. At work Thomas spends most of his time looking into company needs, such as software, computer,

and networking equipment. He decides which equipment, software and tools are needed to help improve the company's overall efficiency. Occasionally, he assists the programmers in creating software, and produces the guidelines in how to create it.

Due to the overall demand of his position, Thomas is always on the go. He relies heavily on technology to make the time he has more productive. Tom does not have the time or patience with poorly designed devices and tends to not waste his time using them if they are not easy to understand. More often than not, Tom takes a taxi to work every day. This allows him to avoid driving in the morning rush and he can also prepare for his day on the cab ride to work. For him the subways are too noisy, crowded and somewhat unreliable.

Tourist

Author: Chris Muench

Andrew Dipietro is a 78 year old retired business man from Italy currently traveling around the world. He has two children and a lovely wife Renee. He never attended college, but started a successful pasta sauce business that has created a comfortable retirement for him and his wife. Andrew lives a pretty

simple life in his retirement. He does not own any expensive gadgets or computers, but does enjoy traveling and discovering the world.

He is currently traveling to large cities in the United States and has noticed that getting around can very a lot from city to city. In Chicago he was able to use a train system for most his travels, but in NYC he has found it sometimes more convenient to use a taxi instead of the Subway (Although sometimes scary with the way people drive). Andrew does find it expensive to travel in a taxi, but he likes the convenience. Andrew does not have any experience with computers and does not want to take the initiative to learn how. Andrew is not a risk taker and is afraid of making mistakes.

Task Scenarios

Sekou Fofana, a 42 year old taxi driver in NYC must complete the task of **setting a destination for a passenger.** It is important that Sekou enters this information into the system so the passenger is aware of the estimated cost and estimated time of arrival. In this case the passenger verbally would tell the driver the destination he would like to go to and Sekou would enter the destination into the system.

The passenger is a tourist who wishes to travel to Central Park. The tourist gets into the taxi, and conveys this information to Sekou. Sekou would then quickly enter this information into his touch screen display and would then start driving to Central Park. Entering this information into the touch

screen display communicates this information to the passenger which is also provided with an ETA, a probable path to the destination, and estimated fare.

Ranjit Manesh, the 49 year old honest taxi cab driver, gets hailed by an older looking Asian couple. They get in the taxi, and it's clear that they don't speak any English. They know where they want to go, but are having a hard time conveying it to Ranjit. So, they **choose their language** on the screen, and type in the address using that. Ranjit is notified on his screen when the couple finishes adding their address, and he is able to take them to where they want to go.

They are shown how much they owe in their native language, so Ranjit doesn't have to try to figure out payments with them. It saves him a lot of trouble, since before the system was installed, it was almost impossible for him and foreign passengers to communicate how much was owed.

Andrew Dipietro, a 78 year old tourist from Italy must complete the task of **riding in a taxi** in NYC. Andrew gets into the taxi, conveys his destination of Times Square to the driver (who then inputs the destination into his display), and Andrew is on his way to Times Square.

During his ride, Andrew is shown a map with the taxi's current position, an estimated time of arrival, and and estimated fare. During his ride, Andrew notices a button labeled "Travel & Weather". He wants to know the weather for tomorrow as he plans to do a lot of walking. He then "taps" the Travel and Weather button and is instantly shown a 3 day forecast for NYC. He is very happy to know that the forecast for tomorrow is 65 and Sunny. He then decides he would like to go back to the map view, so he simply chooses "Back To Map" from the display. He views that there is 3 minutes until he arrives with an estimated cost of $18.00. He is satisfied with his ride and enjoyed the added productivity the taxi brought him.

Thomas Shanahain, is a 24 year old Systems Analyst in NYC who must complete the task of **paying for a taxi ride**. After a 30 minute cab ride from Staten Island, Tom arrives right outside his office located near ground zero. He finishes up making a dinner reservation for later that evening. The taxi driver then confirms that they have reached their destination by pressing a button on his display.

A notification pop up alerts Tom that his bill for the taxi ride is ready. Tom finishes up making his reservation and presses "Payment" option on the touch screen. He is relieved to see that the his ride was cheaper then his previous ride from the other day. It was only $15 compared to the $25 he payed with the other cab driver. Tom scrolls through the payment options by flicking his finger on touch screen. He is pleased to see that there is a metro card option. Tom takes a quick glance at his cell phone's clock and notices he is running late for his 8:00am meeting. He frantically swipes his metro card and then chooses to give $3.00 for tip from a preset amount menu. Tom then chooses the option for no receipt and taps the "Done" button to complete his transaction. Tom gathers his things quickly, thanks cab driver, and quickly heads off to his meeting.

Bob Smith knows a lot of his customers bring newspapers into the cab, and his drivers have told him some customers would like to be able to quickly pay with credit cards. He's read about a system in NYC that installs a computer display into the cab to show advertisements and news. He'd like to try out this in his own cabs, since no one else in LA has anything close he figures he'll blow people's expectations of the cab ride. Bob needs to setup the system with local maps and points of interest, these are provided. He also needs to load advertising screens and select what types of news are available. He only wants to do this once.

Bob will login to the central server in his office at Red Top LA Taxi, and be greeted by the first-setup wizard. He enters basic information about the company, location, area serviced, and etc. The wizard then allows him to select which parts of the system he'd like to configure. He selects news, and then checks several boxes which appear to be newspaper section headings. He then would like to install advertisements. He was given a CD from some advertisers he secured with promotions in common picture formats on it. He adds each advertisement and associates the picture with it. Bob then realizes he chose a news feature he didn't want and simply returns to that screen from the main menu and unchecks it. Bob is happy, and exits the menu to sync his changes to the fleet.

Usability Goals

Choose Destination (Matt) | Make Reservation for local attraction (Gregory) | Pay for ride (Chris)| View Flight Status (Phil)

Pay for a ride

Many different types of user's of all levels will be using our system to pay for their ride. While a user can avoid using the computer by paying with cash, many will like the convenience of paying for their ride with a credit card. Users of our system come from all walks of life. Some are tourists with no computer experience (such as Andrew) while others such as Thomas (virtual technogeek) who are surrounded by computers all the time.

Since paying for a ride will be one of the most used features of the system, it must be very easy to use. Many users are already familiar with using their credit card at grocery stores and kiosks, so we will try to model our system after that.

The metrics for testing this task are: the time it takes to complete the task, the number of errors made, and the number of interventions required to push the user though the task. This task is very critical to the system so errors cannot happen at any level of acceptance.

1. Time in seconds it takes to pay using credit/debit card (starts when taxi ride ends)
    - Optimal- Under 10 seconds
    - Desired - Under 20 seconds
    - Acceptable - Under 30 seconds
2. Number or errors made while paying for ride with credit/debit
    - Optimal, Desired, Acceptable- No errors
3. Number of interventions required while
    - Optimal- 0 Interventions
    - Desired - 0 Interventions
    - Acceptable - 1 Interventions

Make Reservation for local attraction

Making a reservation for a local attraction will be a feature of our system that will be mostly used by tourists. Although this feature might be used by commuters, it is highly unlikely. In order for this feature to be successful, a tourist must be able to make a reservation very fast with a clear understanding of what they are doing. It must also be very easy to find local attractions so a user would actually want to user a taxi system to make a reservation at an attraction.

The metrics for testing this task are: time it takes to successfully make a reservation at a local attraction, number of interventions required, and number of errors made. Acceptance levels have been created for each metric.

1. Time in seconds it takes to make reservation (starts when specific local attraction is chosen)
    - Optimal- Under 30 seconds
    - Desired - Under 45 seconds
    - Acceptable - Under 60 seconds
2. Number or errors made while paying for ride with credit/debit
    - Optimal, Desired- No errors
    - Acceptable - 1 error
3. Number of interventions required while
    - Optimal- 0 Interventions
    - Desired - 0 Interventions
    - Acceptable - 1 Interventions

Choosing a Destination

Choosing destination feature will be used by anyone who wishes to use the display when picking a location they would like to go to. For this feature to be used it needs to be intuitive and allow user to input data in a fast pace manner with minimal error. It needs to be fast enough for user to prefer using this feature than the standard interaction of telling the cab driver where they need to go.

The metrics for testing this task are: Time it takes to successfully input destination, number of interventions, and number of errors made. Acceptance levels have been created for each metric.

1. Time in seconds it takes for user to input destination (starts after desired language is chosen)
    - Optimal- Under 45 seconds
    - Desired- Under 60 seconds
    - Acceptable- Under 70 seconds

2. Number of errors made while inputting destination with keyboard

    - Optimal- 0 errors
    - Desired- 1 error
    - Acceptable- 2 errors

3. Number of interventions while performing task

    - Optimal - 0 interventions
    - Desired - 0 interventions
    - Acceptable- 1 intervention

View Flight Status

Additionally, we'll be integrating with major airline systems to allow riders to check on their flight status while still in the cab on the way to the airport. We will use a small on screen keyboard to allow the rider to input their ticket information. The keyboard should involve only the keys required so as to mitigate risk of superfluous key presses. Some metrics involved in measuring this task are the length of the entire transaction from selecting the feature to receiving information, errors made in selecting airline and entering information, and operator intervention.

1. Time in seconds

    - Optimal- Under 15 seconds
    - Desired- Under 30 seconds
    - Acceptable- One Minute

2. Errors

    - Optimal- 0
    - Desired- 0
    - Acceptable- 1

3. Assistance

- Optimal- 0
- Desired- 0
- Acceptable- 1

Overall System evaluation

Besides having goals for individual tasks for our system, we would survey each user tested to gauge their overall feeling of the system's usefulness.

1. Ask user if the system would be useful to them

- Desired- 10 out of 10 users said YES
- Optimal - 8 out of 10 users said YES
- Acceptable 5 out of 10 users said YES

2. Ask user if there are any feautures missing

- Desired- 1 out of 10 users said could provide and describe a feature missing
- Optimal - 3 out of 10 users said could provide and describe a feature missing
- Acceptable 5 out of 10 users said could provide and describe a feature missing

Sources

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