CS 6750 Human-Computer Interaction Assignment P2

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1 QUESTION 1: DIRECTNESS & INVISIBILITY

Here are some daily tasks I perform during the first hour in the morning after waking up from bed. Out of these tasks, I selected four tasks (highlighted in Table 1) for further analysis and in-dept discussion in Table 2. These examples were chosen deliberately to show varying levels of directness and invisibility.

Table 1 — Tasks, goals, interfaces and objects

| Task	Goal	Interface	Object
Turn alarm off	Stop the alarm from beeping	Button on the clock	Beeping sound from alarm clock
Brush my teeth	Clean my teeth for good oral hygiene	Toothbrush	Teeth
Prepare coffee	Make myself a cup of coffee for breakfast	Coffee machine	Coffee
Check calendar	Get an idea of my schedule for the day	Outlook Calendar	Meeting appointments
Check new emails	Get an update on communication from my work email	Outlook Inbox	Email messages
Enter stock symbol on Yahoo! Finance	Get an update on current stock price	Yahoo! Finance Website	Stock price action chart
Join a scheduled meeting on Zoom	Collaborate and discuss a work related project with co-workers	Zoom App	Virtual meeting

Table 2 — Level of Directness and Invisibility of Interaction

Task	Directness	Invisibility
Turn alarm off	**High** – Hitting the button on the alarm clock stops the beeping sound instantly.	**High** – Seamless experience, hardly think about the interface. Repetitive behavior every morning. By design, the clock interface is pretty intuitive. Habitual learning makes this task like a second nature.
Prepare coffee	**Low** – The object here is the coffee which I do not have direct manipulation. I rely completely on the coffee machine to add water and brew the coffee from the pod.	**Low** – I have to take into consideration of the interface quite a bit to ensure it completes the task successfully: enough water in the reservoir, coffee pod has been inserted, and proper settings on the machine are selected. At times when the machine malfunction or doesn't make coffee, it takes quite a bit effort to troubleshoot. There is no indicator to suggest what has gone wrong.
Enter stock symbol on Yahoo! Finance	**High** – The object here is the stock chart of my interest. I can pull the chart on Yahoo! Finance website by simply entering the stock symbol. Stock price is updated in real-time during market open.	**Medium** – While displaying the chart is fairly easy, it requires that the users are familiar with how the chart is setup to show the stock price movement. A user can select different chart types, such as OHLC (open-high-low-close), bars, line etc. By learning and gaining more experience, a user increases his proficiency in reading charts and identifying price trend. Experienced users (i.e., professional traders) are capable of recognizing chart patterns to predict price movement.
Join a scheduled meeting on Zoom	**Medium** – This app creates a virtual environment for participants to connect and collaborate. However, the interface itself still imposes some limitation on how much interaction is possible. The virtual space is constrained by the screen asset and what can be captured through the camera.	**Medium** – In this case, I am still aware of the interface (Zoom App) where I interact with co-workers, but it does not get in the way most of the time. Tools such as poll, chat box and 'share screen' help to facilitate interactions among the participants in the session. By design, it is effective for users to focus on the interaction and conduct a productive meeting with very minimal attention to the interface.

2 QUESTION 2: INVISIBLE BY LEARNING – STOCK TRADING

A task that I do regularly is trading stocks and managing my investment portfolio. This is done through the online trading platform offered by my broker – FIRSTRADE.

Figure 1 – FIRSTRADE Online Trading Platform
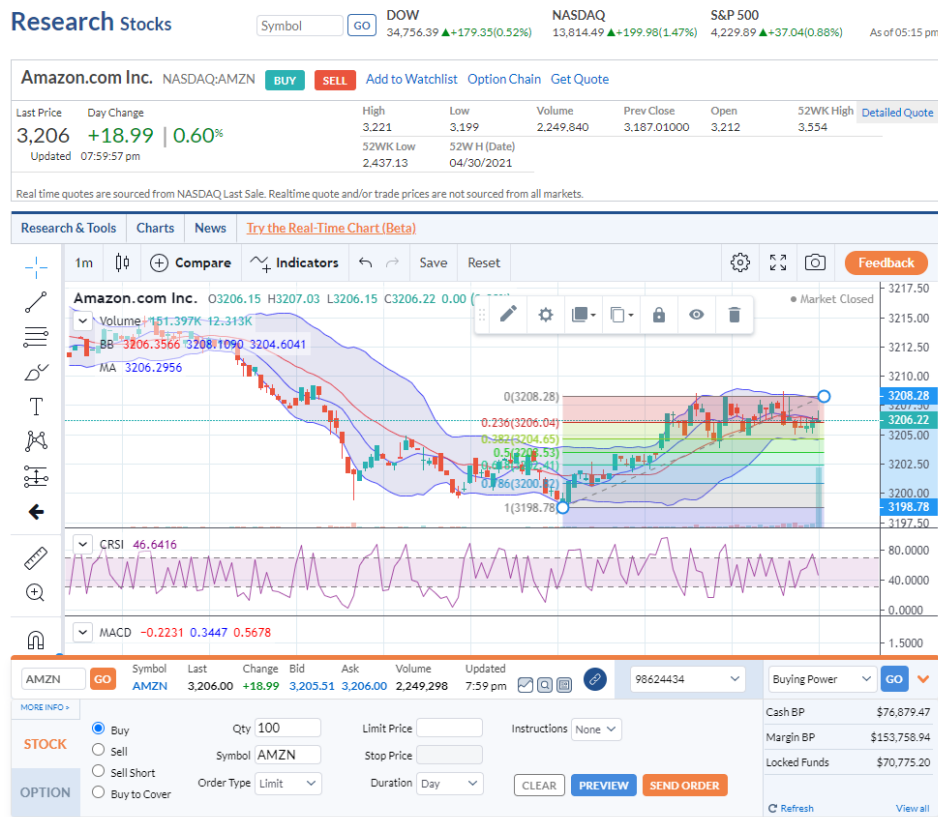
2.1 Components of the interface

As you can see in Figure 1, the trading interface is fairly complex. It is designed to be features rich and highly customizable to meet any trading styles and user needs. The goal is to empower traders with information and tools to analyze stocks and take appropriate buy and sell actions. However, the complexity of the interface can be very overwhelming especially for novice users.

Here are the 5 key components on the interface:

- **Quote** – Real-time quotes (Bid and Ask), trade volume, precent change and high/low of the stock price.
- **Real-Time Price Chart** -Shows the price movement of the stock at different time frames (1|5|10 minutes, 1|2|3 days, 1|2 weeks, or 1|3|6|12 months). A user can select different type of charts: line, bars, candles, Heikin etc.
- **Trading Indicators and Tools –** A massive list of tools and indicators such as trendline, Fibonacci levels, Bollinger bands, Hull Moving Average, MACD, Relative Strength Index and many others. Indicators are mathematical calculations which can be plotted on the chart, to help traders identify certain signals and trends.
- **Trade Execution** – This is where the trade is entered as a buy or sell order.
- **Account Summary** – Current profit/loss, balance available for trading.

2.2 Thought Process

When I first started to trade using this interface, I had to go through a huge learning curve. FIRSTRADE provides very helpful education materials from basic to advance levels in the form of recorded videos and webinars. I spent countless hours of learning and took advice from other experienced traders to find the right trading style that fits my investment goals and risk tolerance. I had to learn how to configure the chart properly and explore the various indicators on the interface. It took me about 1.5 months of practicing paper trading on this interface before I gained enough confidence to trade with real money.

Nowadays, I don't think much about the interface. I am very familiar with the tasks needed to execute a trade efficiently and where to look for the information I need. The chart layout has been optimized with only a few key indicators that are most helpful to me. I can now focus on reading price action and analyzing stock trend to decide on a trade.

2.3 Design Improvement

Here are two suggestions to consider for making the trading interface invisible by design:

- **Adaptive Interface Based on Users Experience Levels**

  Rich features and customization allow a trader to perform advanced and in-dept analysis, but it is overkill for novice users. A potential re-design is to provide two different interface setups for the user to choose: basic and advance. The basic setup focuses on simplicity with key features only. This takes away the complexity and reduces cognitive load for new users to execute a trade. Eventually, a user can progress to advance setup as his skills and comfort level grow by experience.

- **Let the Interface Teach**

  The broker has done a great job in providing learning materials to the users. However, it is best to let the interface do the teaching. One way is to embed pop up information when clicking on certain features. For example, by clicking on an indicator, it explains to the user what it is and suggests how it can be used. Another way is to provide real-time help such as using AI (Artificial Intelligent) Bot to provide suggestions when the user is performing a task or exploring a feature on the interface.

3 QUESTION 3: HUMAN PERCEPTION – COOKING A MEAL

For this exercise, I've chosen the task domain in *cooking a meal* to further explore human perception in a feedback loop.

Table 3 – Visual, auditory and haptic feedback in Cooking a Meal

Perception	Current Feedback	New/Suggested Feedback
Visual	LED indicators and LCD screens are commonly found on cooking appliances to visually inform the users of the operation state. For example, when pressing a button on the rice cooker, LED will lid up indicating the type of rice you have selected. This is a simple feedback, but it reassures the users the correct cooking	It is useful to observe changes on the appearance of the food during the cooking process. This helps to indicate how well it is cooked to the desired state. For example, when frying a chicken, it changes from pink or preachy to golden yellow when it is ready. When over cooked, it turned brown. For enclosed appliances

Perception	Current Feedback	New/Suggested Feedback
	option has been activated. On the other hand, LCD screen is a more advance execution. On an oven, it can show temperature and how long it has been cooking.	such as oven, a build-in camera inside the oven chamber will enable a user to visually monitor the food while it cooks.
Auditory	Sound is another common feedback found in the kitchen. Pressing a button on the Microwave is immediately accompanied by a beeping sound. This indicates that the user has successfully entered a command. Sound can also alert the user. When the Microwave completed a reheat cycle, it triggers another beeping sound to let the user know that the food is now ready to serve.	Voice or verbal feedback in natural language has great potential. This approach delivers higher definition of feedback than the beeping sound. For instance, it could say out loud the precise temperature or how much time is left for the cooking. It can also provide instructions to the users (e.g., "please flip the patty" or "please stir the pot").
Haptic	Haptic feedback is less commonly used, but here are two examples: (1) Increasing resistance as you turn the timer knob on an air fryer indicates how close to maximum cooking duration is allowed. (2) The heat emitted from the oven reaffirms that the appliance is warming up, even though it is not precise enough to know the exact temperature.	Here are some other ideas to implement haptic feedback: • Handle or lid would vibrate slightly when touched to caution the users that the food inside is still very hot. • Knife that increases in resistance as it gets near your fingers. This feedback helps to prevent accidently cutting yourself.

3.1 Alternative Sensory Feedback

Besides the three type of human perception discussed above, taste would be an interesting sensory feedback to explore in the cooking domain. After all, the flavor of the food is what people care most about. Sometimes, it is not advisable to taste the food before it is fully cooked due to risk of food poisoning. Flavor or taste of the food also gradually changes during the cooking process. Imagine we invented a sensor to detect taste or it can be artificially re-created to provide the following feedback to the users at any stages of the cooking:

- Do I have the right ingredients?
- Have I added enough of the ingredients or too much?

4 QUESTION 4: REDUCING COGNITIVE LOAD

Here, I will discuss two examples of reducing cognitive load: *using multiple modalities* and *offloading tasks from the user onto the task.*

4.1 Using Multiple Modalities – Walmart App

Walmart is one of the first grocery retailers in US to introduce online grocery shopping with same day curbside pickup. With this app, you can order any grocery item and schedule a pickup at a nearby Walmart store.

Figure 2 – Walmart App for grocery pickup order
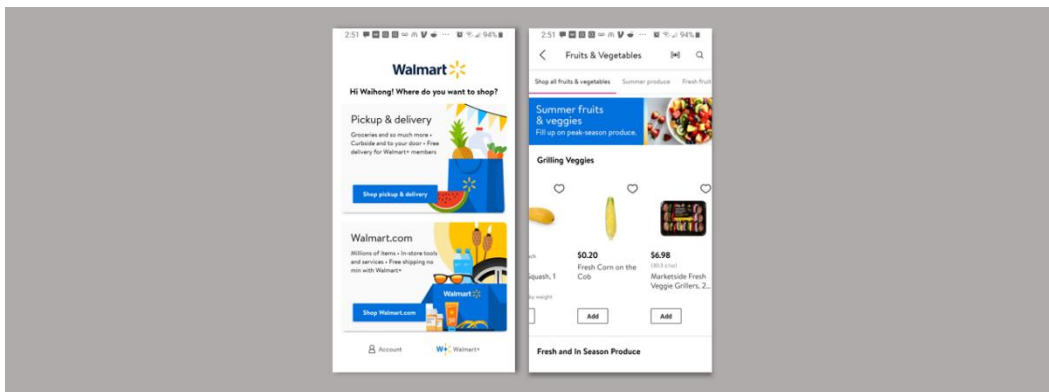
- **Problem:** The only way a user can place order today is by browsing items on the app, adding them to a basket and then checkout. The entire procedure relies heavily on our visual perception to complete the task successfully. This becomes a problem when multitasking such as driving, cooking or babysitting.

- **Redesign:** To address this issue, we should consider redesigning the app to include voice interaction. For instance, I can simply initiate the order by saying "Siri, please order a gallon of Milk to pick up at my nearest

Walmart store in an hour". After the order was received by Walmart, I will get a voice confirmation from Siri and later, follow by a reminder to pickup the item when it is finally ready. By adding voice modality to the app, it increases the usability of the app especially when the visual apparatus of the user is fully engaged in other activities.

4.2 Offloading Tasks onto the Interface – American Airlines Booking Tool

American Airlines offers an online booking tool where you can search for available flights and make a reservation.

Figure 3 – American Online Booking Tool

- **Problem:** To make reservation for multiple passengers with this tool, you must enter personal details for each member every time you do the booking (i.e., full legal name, date of birth, frequent flyer program, passport or ID, Known Traveler Number etc.). More than likely, you are not going to remember all the required details, or you simply do not have the information on hand to complete this step.

- **Redesign:** A simple solution here is to allow storing of passengers' details and auto populate the required information during this task. This information can come from previous reservation, or by the user entering the data and saving the passenger in his contact list. By doing so, it helps to reduce cognitive load of the user and make this task easier and quicker to complete.